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# A PRACTICAL TREATISE

ON

# Materia Medica and Therapeutics

## WITH ESPECIAL REFERENCE TO THE CLINICAL APPLICATION OF DRUGS.

BY

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**THIRD EDITION. THOROUGHLY REVISED.**

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TO

THE MANY PUPILS

WHO HAVE ATTENDED HIS LECTURES DURING THE PAST
TWENTY-ONE YEARS AND ARE NOW PURSUING THEIR
PROFESSION IN THE UNITED STATES OF AMERICA
AND IN MANY FOREIGN COUNTRIES,

THIS VOLUME,

ILLUSTRATING AN ALL-IMPORTANT AND PRACTICAL
DEPARTMENT OF MEDICINE, PHARMACY,
AND DENTISTRY,

IS

RESPECTFULLY INSCRIBED BY THEIR TEACHER,

THE AUTHOR.

# PREFACE TO THIRD EDITION.

In preparing a third edition of this work the author has taken the opportunity of combining into one the two volumes which had been separately published, believing that the value of the book will be thus enhanced.

The skill of chemists and the zeal of clinicians have, during the past two years, introduced many new preparations to the profession. New applications of the older remedies have also, in many instances, been discovered. Since the publication of the second edition the field of usefulness of many medicinal substances has been greatly enlarged. Based upon increasing experience much additional matter has required insertion in the descriptions of acetanilid, antipyrin, creosote and its derivatives, hydrogen dioxide, salophen, trional, dermatol, new naphthol and phenol compounds, etc. Among the most recent compounds upon which new articles or sections have been written are tolysal, tolypyrin, salocoll, salacetol, chlorphenol, bromphenol, ethylendiamine silver phosphate, tropacocaine, formaldehyde and formalin, dulcin, tannigen, etc. The subject of treatment by means of animal extracts, secretions or juices, and immunized serum or antitoxines has been rewritten, and the endeavor has been made to give a fair presentation of the present state of knowledge concerning the value of these agencies in combating disease.

The enumeration of preparations has been made to accord with the United States Pharmacopœia of 1890, and the indexes have been thoroughly revised.

The natural forces and physiological agencies discussed in this volume are of immense importance in therapeutics, and are often of more avail in the treatment of disease than medicinal substances and drugs.

Philadelphia, 1519 Walnut Street,
October 1, 1895.

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# PHARMACOLOGY AND GENERAL THERAPEUTICS.

## PART I.

## PHARMACEUTICAL REMEDIES OR DRUGS.

**GENERAL CONSIDERATIONS.**—In the treatment of disease, recourse is generally had to certain agents which are known collectively as **remedies.** In point of fact, every preventive, reparative, or restorative means, which is, or can be made, available for the relief of the sick, or which is in repute for counteracting the effects of bodily disorder from any cause, is a remedy, or remedial agent, in a comprehensive sense of the term. It follows from this that remedies are of many kinds and of varying importance; indeed, they are almost as numerous and diverse as the causes of disease themselves. The principal classes of remedies, however, are comparatively few, and these may now be taken up systematically for consideration. A prominent form of remedial measure is that which seeks to remove the patient from the influence of unsanitary influences and to place him under more favorable conditions for recovery than those under which the sickness originated; such are known as **prophylactic** or **hygienic remedies.** They presuppose, on the part of the medical attendant, an acquaintance with the physiological laws of the human body, and of the effects of food, clothing, climate, occupation, habits, etc., upon its functions. Among prominent hygienic remedies are dieting, bathing, ventilation, change of residence or of occupation, due regulation of habits, and especially regulated exercises, including gymnastics and massage. These are **sanitary** or **hygienic agents** when employed to preserve health and prevent disease; they become **sanatory measures** when utilized in conjunction with the proper medical remedies, as they constantly are, in the treatment of the sick, with a view of hastening and facilitating their recovery. In the latter case, they are also included under the comprehensive term **regimen.** It is now considered of as great or even greater importance to properly regulate the ventilation and temperature of the sick-room, to direct the bathing and food of the patient, and to decide whether he shall have rest or exercise, in most instances, than it is to frame a prescription nicely adjusted to the state of the case; although the latter is by no means to be slighted. Light, heat and cold, magnetism and electricity are also remedial agents capable of powerfully influencing the bodily functions, and, when wisely directed, may produce positive sanatory or curative effects. These **imponderable remedies** or **forces,** as they have been called, are receiving much attention at the present day; and, as a result of the profound and painstaking investigations of many scientists and the careful observations of expert clinicians, the medical practitioner is now, for the first time, in a position to satisfactorily apply these agents and to record the results of his studies in exact and scientific terms. **Mechanical remedies** include various surgical measures, such as acupressure, acupuncture, aspiration, bandaging, blood-letting, etc.; also the various forms of gymnastics known under the name of Swedish movements, the movement cure, passive motion, etc.; and last, but by no means the least important among remedies which, at least, are partly mechanical, is massage, to which attention has been already called as a hygienic agent, and to which due consideration will be given hereafter in a special section, under **Kinesitherapy.** Finally, there is a class of remedies which are considered of such importance, and are so commonly used in the treatment of every condition of disease, that they are popularly termed "medicines"; these properly are **drugs** or **pharmaceutical remedies.** Formerly they were divided into chemical agents and drugs proper, or Galenicals; but this distinction has lost its force, since it has been shown that herbs, or "simples," owe their medicinal effects to "active principles," which are chemical in their nature, and which may be, and commonly are, administered separately, to produce the proper physiological and therapeutical effects of the drugs.

**Pharmacology** is the science of drugs; it is made up by contributions from all sources of knowledge bearing upon the natural history of remedies, their botanical and chemical relations, their effects upon the body both in health and in diseased conditions, and, in short, everything with regard to such an agent, viewed from a medical standpoint. For convenience, subdivisions of this comprehensive subject have been generally employed. **Materia Medica** is devoted particularly to the study of the source of drugs, their physical and chemical properties and constituents, and includes medical botany and pharmacodynamics, or the physiological action of remedies upon the lower animals and upon man; understanding by the term physiological action of a remedy the sum total of the effects produced upon different organs and tissues, with the resulting disturbance of function, in an animal otherwise in health. **Pharmacy** analyzes and identifies drugs, provides useful and attractive preparations, and teaches the best methods of administering them. **Toxicology** studies the actions of poisons or toxic doses of drugs, with their antidotes, chemical and physiological, as well as other measures to be pursued to minimize or antagonize their deleterious effects.

**Therapeutics** is especially concerned with the application of remedies to the treatment of disease and the proper care of the sick. Other medical studies are only the foundation, therapeutics is the superstructure; as Fothergill well said, "the ultimate aim of all medical research is the treatment and prevention of disease." For convenience it is divided into surgical and medical therapeutics. Many systems of therapeutics have been promulgated in times long past before the era of science, or the application of exact scientific methods to the study of the action of drugs and the investigation of pathological and clinical problems. Having at length a sound foundation of accumulated knowledge and experience upon which to rest our practice, we are prepared to base a system of **rational therapeutics** upon the demonstrated and established effects of drugs and our knowledge of the nature of morbid processes in the human body. The only scientific system possible is one which (1) endeavors to remove morbific causes or render them inoperative; (2) seeks to repair the ravages of disease or to correct abnormal physiological action; (3) aims to ameliorate the condition of the patient by relieving prominent symptoms, such as pain, fever, sleeplessness, loss of appetite, etc., and (4) to place him under circumstances most favorable to recovery. **Symptomatic treatment** which seeks merely to remove symptoms, without investigating their causes, is obviously unsatisfactory and unscientific, but occasionally is resorted to in an emergency when such symptoms are urgent. **Empirical treatment** was the only kind of treatment possible before the mode of action and the effects of medicines were understood; it merely directed that certain medicines should be taken for the reason that in apparently similar conditions their administration had been followed by good results. Owing to the fallacious character of the teachings of experience, as pointed out by Hippocrates in his celebrated aphorism, it results that pure, blind empiricism abounds in error, and, as a rule of practice, is the poorest system of treatment to follow. On the other hand, where the knowledge obtained at the bedside is aided by sufficient acquaintance with the physiological action of drugs, already referred to as rational therapeutics, we have an **enlightened empiricism**, which should, on the contrary, be the best practice possible, since it affords to the patient all the assistance which science and experience combined can provide toward hastening and completing his recovery. It is not based on fixed law, but is progressively improving in proportion with advances in other departments of science. Any school of medicine assuming to rest upon a foundation less broad than this, or on a system which is fixed and stationary, by its own terms separates itself from the scientific study and practice of medicine, and makes its followers a medical sect or "school." In the course of centuries many such schools have been brought to light, and, after a brief period, have been outgrown and forgotten. Such a fate is the natural destiny of any restricted system, based upon dogma and not upon observation. The system of medicine which is studied as a department of natural science, and which is unrestricted by any hypothesis or supposed law of cure, in its application of remedies to the treatment of disease, will undoubtedly vary somewhat in its results, according to the individual skill of its practitioners, the scientific attainments of the time, and the peculiarities of patients; but when statistics are correctly compiled from sufficiently large groups of cases it is easily demonstrated to be more successful than any restricted system which has been or can ever be brought in competition with it. In order to avoid misapprehension, it may be proper at the outset to explain that in the present treatise the system of scientific or so-called "regular" medicine, as just described, will be followed. This is quite distinct from any school or sect in medicine, and also equally separate from allopathy or allopathic practice. Although many persons ignorantly confound them, a radical difference exists, as every educated physician knows, between a "regular practitioner" and an "allopathic doctor," inasmuch as the latter is sectarian and the former non-sectarian.

At the same time that we discard restrictions as to therapeutics and employ whatever remedial means experiment and observations lead us to believe will benefit our patients, it should not be forgotten that the knowledge at our command is derived from various sources, and if we are willing to acknowledge the indebtedness of modern medicine even to native tribes for many useful remedies, we should not be above admitting that useful lessons may also be occasionally learned from followers of exclusive schools of medicine, or so-called irregular physicians. "Every judicious physician," says Dunglison, "must be an eclectic," in the sense that he selects from every source the best means of controlling disease. In the ordinary restricted sense, an eclectic is one who confines himself to vegetable drugs, or, in other words, is a botanic physician, and in this sense it has been appropriated by a sect of physicians who were formerly known as Thomsonians, from the name of the founder. In the ranks of regular medicine, also, there are specialties in therapeutics, some confining their practice to massage or gymnastics, others to electricity, others again to bathing, or hydropathy. The qualified physician or general practitioner appreciates the value of all the various agencies that are used in treating the sick, and assigns to each its proper place in his therapeutics, directing his treatment not against disease, but to the improvement of patients temporarily in a diseased or abnormal condition.

A complete cyclopædia of therapeutic agents should include in its consideration every remedial measure which the best educated and most skillful physicians employ in treating the sick, giving to each its proper place and value. As there are separate treatises upon hygiene, dietetics, massage, balneology, and electro-therapeutics, and the importance of these subjects warrants their separate treatment, modern text-books of therapeutics are usually restricted to treatment solely by pharmaceutical remedies, or drugs. Nevertheless, in the present work due consideration is given to other forms of remedial agencies, and electro-therapeutics, hydro-therapeutics, masso-therapeutics, metallo-therapy, balneology, climatology, and hypnotism will be found discussed hereafter under their own titles.

## PHARMACOLOGY, PHARMACOGNOSY, AND THE PHARMACOPŒIA.

**Pharmacology** (φαρμακον, a medicament, and λογος, a treatise) is, properly speaking, the science of drugs, and is limited, first, to **Pharmacognosy**, or the study of their natural history, their physical and chemical characters, tests for purity, etc.; secondly, to **Pharmacy**, which comprises the various methods of compounding and dispensing them in their several combinations for use in the treatment of disease. Some authors have restricted the term "pharmacology" to the results obtained from the study of the physiological action of drugs, but this is more appropriately named "pharmacodynamics." Good usage and etymology support the definition given above. Both pharmacodynamics and therapeutics, however, in so far as they relate to drugs, may be considered as departments of pharmacology, in a broad sense of the term.

The **Materia Medica**, or pharmacological remedies, may be divided into crude drugs and preparations. The latter may be made according to established formulæ, both non-officinal and officinal, or they may be extemporaneously compounded and dispensed according to the directions furnished by a physician. The latter are known as "magistral" preparations; they are compounded according to the formula contained in the prescription, of which more will be said presently. Officinal preparations are those recognized by authority of the pharmacopœia and directed to be kept in the shops (*officina*, a shop) ready for dispensing. These are now known as "official" preparations, because they are issued by the authority of the pharmacopœia. Since this authority does not extend beyond the geographical limits of the country to which it belongs, it follows that England, France, Germany, Sweden, and other countries, as well as the United States, have pharmacopœias of their own. Remedies belonging to each usually have after them initials indicating their source; thus, U. S. P. means United States Pharmacopœia; Ph. Br., British Pharmacopœia; Ph. F., French Pharmacopœia, or Codex Medicamentarius; Ph. G., German Pharmacopœia; Ph. Sw., Swedish Pharmacopœia. In the usual and modern acceptation of the term, a **pharmacopœia** is a medical book, issued by authority, containing a list of recognized drugs, with descriptions and physical characters, tests for purity and medicinal activity, and formulæ for accepted preparations. Drugs and preparations authorized by the pharmacopœia become in this way official. The necessity of having some standard to define the character, establish the purity, and regulate the strength of medicinal preparations is universally conceded. Those countries which do not possess a pharmacopœia of their own, usually adopt the French Codex or the British and United States Pharmacopœias. Unfortunately, it may happen that a preparation will have the same title but differ considerably in strength in different pharmacopœias, such as the tincture of belladonna and the tincture and extract of aconite, which might lead to error in copying formulæ from English, French, or German sources, since these preparations in the United States Pharmacopœia are considerably stronger than the corresponding English preparations.

The Pharmacopœia of the United States is not issued directly by authority of the government, as in most other countries, although it is adopted by the government in the medical departments of the army, navy, and marine-hospital service. It is compiled as a voluntary undertaking by the physicians and pharmacists, in accordance with a peculiar arrangement. Every ten years representatives from medical societies and colleges, pharmaceutical societies and colleges, and delegates from the Army, Navy, and United States Marine-Hospital Service, meet in Washington, forming the National Convention for the Revision of the Pharmacopœia. After organization and the disposal of business which may come before it, a standing committee on revision is appointed, which, having received instructions from the convention, proceeds to prepare and publish an edition of the United States Pharmacopœia. The first issue was in 1820, and the seventh revision appeared in 1893. Many new remedies have been brought to the notice of the profession since the last revision, some of which have come extensively into use and possess decided merit, others are ephemeral and will soon sink into well-deserved neglect. Owing to the present degree of activity in therapeutics, it is impossible that the pharmacopœia should include all the medicinal agents used by physicians in the treatment of disease, especially those only recently introduced. Therefore, a considerable number of **unofficial drugs** are in use, some of which will eventually prove their right to be recognized and become official, while many others will never be able to make good their claim. Proprietary remedies, patent medicines, and preparations made by secret formulæ are sold very largely to the public, and are sometimes prescribed by physicians, who appear to be unmindful of the fact that the Code of Ethics denounces this as a reprehensible practice, calculated to injure both the patient and the medical profession. The prescribing of preparations of unknown composition is opposed to the best interests of scientific medicine and the public.

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## MATERIA MEDICA.

The **Materia Medica** consists of officinal and non-officinal drugs and their preparations. It has several branches. Pharmacognosy investigates the physical characters of drugs in order to establish their identity. Medical botany establishes their place in the vegetable kingdom and their botanical grouping or relationship. Chemistry determines the constituents of the drug and isolates the so-called active principles; it also teaches the chemical antidotes In the United States Pharmacopœia all remedies are arranged under their Latin titles alphabetically, and, owing to its covenience, the same plan has been adopted in Part III of the present work. It is possible to adopt either a natural method of classification of drugs, or an artificial arrangement into classes according to the physiological or therapeutical effects. A scheme of the latter kind appears at the conclusion of this section. The following list contains most of the drugs in use, arranged according to their natural affinities and chemical characters. It is similar to that adopted by Brunton in his well-known work on "Pharmacology, Materia Medica, and Therapeutics."

### Inorganic Materia Medica.

#### Group I—*Non-Metals.*

Hydrogen.
Oxygen (Ozone, hydrogen dioxide).
Sulphur (Hydrogen sulphide).
Carbon (Charcoal).
Bromine (Acid hydrobromic).
Chlorine (Lime chlorinated, Soda chlorinated).
Iodine (Acid hydriodic).
Nitrogen (Acid nitric, etc.).
Phosphorus (Acid phosphoric).

### Group II—*Metals* (a) *of the Alkalies and Alkaline Earths.*

*Monad Metals.*—Potassium, Sodium, Lithium, Ammonium.

*Dyad Metals.*—Calcium, Strontium, Barium, Aluminum, Magnesium, Zinc, Copper, Cadmium, Silver, Mercury.

### (b) *The Heavy Metals.*

*Triad Metals.*—Thallium, Iridium, Gallium.
*Tetrad Metals.*—Lead, Tin.
*Pentad Metals.*—Nitrogen, Phosphorus, Arsenic, Bismuth, Antimony.
*Hexad Metals.*—Chromium, Tungsten, Molybdenum.
*Heptad Metal.*—Manganese.
*Unclassified Metals.*—Iron, Nickel, Cobalt, Platinum, Gold.

## Organic Materia Medica.

### Group I—*Carbon Compounds.*

#### (*a*) FATTY SERIES.

Hydrocarbons.
Benzinum.
Petrolatum.
Alcohol (Ethylic), Methylic, Amylic).
Aldehydes (Ethylaldehyde, Paraldehyde).
Ether.
Ethereal oil.
Acetic ether.
Ethyl and Amyl nitrite.
Nitro-glycerin.
Ethyl bromide and iodide.
Chloral hydrate.
Bromal hydrate.
Butyl-chloral hydrate.
Methylene bichloride.
Chloroform.
Iodoform.
Iodol.
Europhen.

#### (*b*) AROMATIC SERIES.

Carbolic acid.
Creasote.
Resorcin.
Hydroquinone.
Pyrocatechin.
Salicylic acid.
Naphthalin.
Naphthol (Alpha and Beta).
Chinoline.
Kairin.
Antipyrin.
Acetanilid.
Sulphonal.
Exalgin.
Phenacetin.

### Group II—*Vegetable Materia Medica.*

#### SUB-KINGDOM I—PHANEROGAMÆ.

#### CLASS I—EXOGENS.

#### DIVISION I—ANGIOSPERMÆ.

#### SUB-CLASS I—THALAMIFLORÆ.

| *Natural Order.* | *Officinal Name.* | *Synonym.* |
|---|---|---|
| Ranunculaceæ. | Ranunculus, | Crow-foot, Buttercup. |
| | Aconitum, | Monkshood. |
| | Staphisagria, | Stavesacre. |
| | Delphinium, | Larkspur. |
| | Pulsatilla, | Meadow anemone. |
| | Adonis vernalis, | False hellebore. |
| | Helleborus, | Hellebore. |
| | Cimicifuga, | Actæa. |
| | Podophyllum, | May apple. |
| | Hydrastis, | Golden seal. |
| Magnoliaceæ. | Magnolia. | |
| | Illicium, | Star anise. |
| Menispermaceæ. | Menispermum, | Canadian moonseed. |
| | Calumba, | Columbo. |
| | Pareira, | Pareira. |
| | Picrotoxinum, | Picrotoxin. |

| *Natural Order.* | | *Officinal Name.* | *Synonym.* |
|---|---|---|---|
| Berberidaceæ. | | Caulophyllum, | Blue cohosh. |
| Papaveraceæ. | | Opium. | |
| | | Sanguinaria, | Bloodroot. |
| | | Chelidonium, | Celandine. |
| Cruciferæ. | | Sinapis, | Mustard. |
| | | Armoracia, | Horseradish. |
| Violaceæ. | | Viola, | Pansy. |
| Lineæ. | | Linum, | Flaxseed. |
| Geraniaceæ. | | Geranium, | Cranesbill. |
| Polygaleæ. | | Senega, | Polygala. |
| | | Krameria, | Rhatany. |
| Sapindaceæ. | | Guarana, | Paullinia. |
| Erythroxylaceæ. | | Erythroxylon, | Coca. |
| Malvaceæ. | | Gossypium, | Cotton. |
| | | Althea, | Marshmallow. |
| Aurantiaceæ. | | Aurantium, | Orange. |
| | | Limones, | Lemons. |
| | | Bergamum, | Bergamot. |
| Sterculiaceæ. | | Theobroma, | Cacao. |
| Ternstromiaceæ. | | Camellia, | Tea. |
| | | Caffea, | Coffee. |
| Guttiferæ. | | Cambogia, | Gamboge. |
| Canellaceæ. | | Canella. | |
| Vitaceæ. | | Uvæ passæ, | Raisins. |
| | | Vina, | Wines. |
| Zygophylleæ. | | Guaiacum. | |
| Meliaceæ. | | Azedarach. | |
| Rutaceæ. | Ruteæ. | Ruta, | Rue. |
| | | Cusparia, | Angostura bark. |
| | Diosmeæ. | Buchu. | |
| | Xanthoxyleæ. | Xanthoxylum, | Prickly ash. |
| | | Pilocarpus, | Jaborandi. |
| Simarubeæ. | | Quassia. | |

### SUB-CLASS II—CALYCIFLORÆ.

| *Natural Order.* | | *Officinal Name.* | *Synonym.* |
|---|---|---|---|
| Rhamneæ. | | Rhamnus purshiana, | Cascara. |
| | | Rhamnus frangula, | Buckthorn. |
| Celastrineæ. | | Euonymus, | Wahoo. |
| Aquifoliaceæ. | | Prinos, | Alder. |
| Terebinthaceæ, | Anacardiæ. | Mastiche. | |
| | | Rhus glabra, | Sumach. |
| | | Rhus toxicodendron, | Poison ivy. |
| Burseraceæ. | | Myrrha, | Myrrh. |
| Leguminosæ. | Papilionaceæ. | Glycyrrhiza, | Liquorice. |
| | | Scoparius, | Broom. |
| | | Tragacanth. | |
| | | Santalum, | Saunders. |
| | | Kino. | |
| | | Balsamum Peruvianum. | |
| | | Balsamum Tolutanum. | |
| | | Abrus, | Jequirity. |
| | | Physostigma, | Calabar bean. |
| | | Hæmatoxylon, | Logwood. |
| | | Chrysarobinum, | Goa powder. |
| | Cæsalpinæ. | Senna. | |
| | | Cassia. | |
| | | Tamarindus, | Tamarind. |
| | | Copaiba. | |
| | | Piscidia, | Jamaica dogwood. |

| *Natural Order.* | | *Officinal Name.* | *Synonym.* |
|---|---|---|---|
| | Mimoseæ. | Acacia, | Gum arabic. |
| | | Catechu. | |
| | | Erythrophlæum, | Sassy bark. |
| | | Indigo. | |
| Rosaceæ. | Pomeæ. | Cydonium, | Quince. |
| | Dryadeæ. | Rubus, | Blackberry. |
| | | Rubus idæus, | Raspberry. |
| | Roseæ. | Rosa, | Rose. |
| | | Brayera, | Koosso. |
| | | Quillaia, | Soap-bark. |
| | Amygdaleæ. | Amygdala dulcis, | Sweet almond. |
| | | Amygdala amara, | Bitter almond. |
| | | Prunus, | Prune. |
| | | Prunus Virginiana, | Wild cherry. |
| | | Laurocerasus, | Cherry-laurel. |
| Papayaceæ, Passifloræ. | | Papayotin, | Papain, papoid. |
| Myrtaceæ. | | Caryophyllus, | Cloves. |
| | | Pimenta, | Allspice. |
| | | Cheken. | |
| | | Myrtus, | Myrtle. |
| | | Cajuput. | |
| | | Eucalyptus, | Blue gum. |
| | | Granatum, | Pomegranate. |
| Cucurbitaceæ. | | Colocynth, | Bitter cucumber. |
| | | Elaterium, | Squirting cucumber. |
| | | Pepo, | Pumpkin. |
| | | Bryonia, | Bryony. |
| Umbelliferæ. | Campylospermæ. | Conium, | Hemlock. |
| | Orthospermæ. | Asafœtida. | |
| | | Galbanum. | |
| | | Ammoniacum. | |
| | | Fœniculum, | Fennel. |
| | | Anisum, | Anise. |
| | | Anethum, | Dill. |
| | | Carum, | Caraway. |
| | | Sumbul. | |
| | Cœlospermæ. | Coriandrum. | |

### SUB-CLASS III—COROLLIFLORÆ.

| *Natural Order.* | | *Officinal Name.* | *Synonym.* |
|---|---|---|---|
| Caprifoliaceæ. | | Sambucus, | Elder. |
| Cornaceæ. | | Cornus, | Dogwood. |
| Rubiaceæ. | Cinchoneæ. | Cinchona. | |
| | Coffeæ. | Ipecacuanha, | Ipecac. |
| | | Caffea. | |
| | | Catechu. | |
| Valerianeæ. | | Valerian. | |
| Caprifoliaceæ. | | Viburnum, | Black haw. |
| Compositæ. | | Pyrethrum, | Pellitory. |
| | | Absinthium, | Wormwood. |
| | | Tanacetum, | Tansy. |
| | | Santonica, | Santonica. |
| | | Anthemis, | Chamomile. |
| | | Matricaria, | German chamomile. |
| | | Eupatorium, | Thoroughwort. |
| | | Taraxacum, | Dandelion. |
| | | Lactuca, | Lettuce. |
| | | Arnica, | |
| | | Calendula, | Marigold. |
| | | Grindelia. | |
| | | Inula, | Elecampane. |
| | | Lappa, | Burdock. |

| *Natural Order.* | *Officinal Name.* | *Synonym.* |
|---|---|---|
| Lobeliaceæ. | Lobelia, | |
| Ericaceæ. | Uva ursi. | Bearberry. |
| | Chimaphila, | Pipsissewa. |
| | Gaultheria, | Wintergreen. |
| Sapotaceæ. | Gutta percha. | |
| Styraceæ. | Benzoin. | |
| Verbenaceæ. | Lippia Mexicana. | |
| Oleaceæ. | Olivæ oleum, | Olive-oil. |
| | Manna. | |
| Loganiaceæ. | Nux vomica. | |
| | Ignatia. | |
| | Gelsemium, | Yellow jasmine. |
| | Spigelia, | Pink root. |
| Apocynaceæ. | Apocynum, | Canadian hemp. |
| | Quebracho. | |
| Asclepiadeæ. | Asclepias, | Pleurisy root. |
| | Asclepias incarnata, | White Indian hemp. |
| | Hemidesmus. | |
| | Condurango. | |
| Gentianeæ. | Gentian. | |
| | Chiretta. | |
| Convolvulaceæ. | Scammony. | |
| | Jalap. | |
| Solanaceæ. | Dulcamara. | |
| | Capsicum. | |
| Atropaceæ. | Belladonna. | |
| | Hyoscyamus. | |
| | Stramonium. | |
| | Tobacco. | |
| Scrophularineæ. | Digitalis, | Foxglove. |
| | Leptandra. | |
| Labiatæ. | Rosmarinus, | Rosemary. |
| | Lavandula, | Lavender. |
| | Mentha piperita, | Peppermint. |
| | Mentha viridis, | Spearmint. |
| | Thymol. | |
| | Hedeoma, | Pennyroyal. |
| | Marrubium, | Horehound. |
| | Melissa, | Balm. |
| | Origanum, | Wild marjoram. |
| | Salvia, | Sage. |
| | Scutellaria, | Skull-cap. |
| Pedaliaceæ. | Sesami oleum. | |

SUB-CLASS IV—APETALÆ.

| *Natural Order.* | *Officinal Name.* | *Synonym.* |
|---|---|---|
| Polygonaceæ. | Rheum, | Rhubarb. |
| | Rumex, | Yellow dock. |
| Phytolaccaceæ. | Phytolacca, | Poke. |
| Chenopodiaceæ. | Chenopodium, | American wormseed. |
| Myristicaceæ. | Myristica, | Nutmeg. |
| | Macis, | Mace. |
| Laurineæ. | Cinnamomum. | |
| | Camphora. | |
| | Sassafras. | |
| | Coto. | |
| Aristolochiaceæ. | Serpentaria. | |
| | Asarabacca. | |
| Santalaceæ. | Santali oleum. | |
| Thymelaceæ. | Mezereon. | |

| *Natural Order.* | | *Officinal Name.* | *Synonym.* |
|---|---|---|---|
| Euphorbiaceæ. | | Cascarilla. | |
| | | Stillingia. | |
| | | Crotonis oleum. | |
| | | Ricinus. | |
| | | Kamala. | |
| Piperaceæ. | | Piper. | |
| | | Cubeba. | |
| | | Matico. | |
| Salicaceæ. | | Salix, | Willow. |
| Juglandaceæ. | | Juglans, | Butternut. |
| Hamamelaceæ. | | Hamamelis, | Witch-hazel. |
| Balsamifluæ. | | Styrax, | Storax. |
| Cupuliferæ. | | Quercus, | Oak. |
| | | Castanea, | Chestnut. |
| Urticaceæ. | Ulmeæ. | Ulmus, | Elm. |
| | Moreæ. | Morus, | Mulberry. |
| | Artocarpeæ. | Ficus, | Fig. |
| | Cannabineæ. | Cannabis Indica, | Indian hemp. |
| | | Cannabis Americana, | American hemp. |
| | | Humulus, | Hops. |

### DIVISION II—GYMNOSPERMÆ.

| *Natural Order.* | *Officinal Name.* | *Synonym.* |
|---|---|---|
| Coniferæ. | Pinus sylvestris. | |
| | Abies excelsa, | Burgundy pitch. |
| | Terebinthina Canadensis, | Balsam of fir. |
| | Pinus Australis, | Turpentine. |
| | Pinus larix, | Larch. |
| | Thuja occidentalis, | Arbor vitæ. |
| | Juniperus, | Juniper. |
| | Succini oleum, | Oil of amber. |
| | Sabina, | Savin. |

### CLASS II—ENDOGENS.

| *Natural Order.* | *Officinal Name.* | *Synonym.* |
|---|---|---|
| Smilaceæ. | Sarsaparilla. | |
| Liliaceæ. | Allium, | Garlic. |
| | Scilla, | Squill. |
| | Aloe, | Aloes. |
| | Veratrum viride. | |
| | Sabadilla. | |
| | Colchicum. | |
| Orchideæ. | Vanilla. | |
| | Cypripedium, | Ladies' slipper. |
| Zingiberaceæ. | Zingiber, | Ginger. |
| | Turmeric. | |
| | Cardamomum. | |
| Irideæ. | Iris, | Blue flag. |
| | Crocus. | |
| Palmaceæ. | Areca. | |
| Aroideæ. | Calamus, | Sweet flag. |
| Gramineæ. | Farina tritici, | Wheat-flour. |
| | Avenæ farina, | Oatmeal. |
| | Amylum, | Starch. |
| | Triticum, | Couch-grass. |
| | Hordeum, | Barley. |
| | Maltum, | Barley-malt. |

SUB-KINGDOM II—CRYPTOGAMS.

| *Natural Order.* | *Officinal Name.* | *Synonym.* |
|---|---|---|
| Filices. | Aspidium, | Male fern. |
| Lichenes. | Cetraria, | Iceland moss. |
| | Litmus. | |
| Fungi. | Ergota, | Ergot of rye. |
| | Ustilago, | Corn-smut. |
| Algæ. | Chondrus, | Irish moss. |

GROUP III—ANIMAL KINGDOM.

| *Class.* | *Order.* | *Officinal Name.* | *Synonym.* |
|---|---|---|---|
| Mammalia, | Rodentia. | Castoreum, | Castor. |
| | Ruminantia. | Moschus, | Musk. |
| | | Sevum, | Suet.<br>Tallow. |
| | | Lanolinum, | Lanolin. |
| | | Lac, | Milk. |
| | | Pepsinum, | Pepsin (from the sheep or calf). |
| | | Fel bovis, | Ox-gall. |
| | Pachydermata. | Adeps, | Lard. |
| | | Pepsinum, | Pepsin (from the hog). |
| | Cetacea. | Spermaceti, | Spermaceti. |
| Aves. | Gallinæ. | Ovi vitellus, | Egg-yelk. |
| Pisces. | Sturiones. | Ichthyocolla, | Isinglass. |
| | Teleosteæ (*fam.* gadidæ). | Morrhuæ oleum, | Codliver-oil. |
| Insecta. | Hymenoptera. | Mel, | Honey. |
| | | Cera, | Wax. |
| | Hemiptera. | Coccus, | Cochineal. |
| | Coleoptera. | Cantharides, | Spanish flies. |
| Helminthes, | Anelatæ. | Sanguisuga, or Hirudo, | Leech. |

In the above comprehensive scheme, which is essentially that of Lauder Brunton, as previously stated, remedies are arranged with reference to their origin, and in this classification many natural relationships are manifested which ordinarily might be unnoticed by the student. It will be observed that drugs are derived from various sources, and vary greatly in their properties, physical and chemical. They all agree in one attribute, however, which is of influencing bodily functions in such a manner as to make them useful in the treatment of diseased conditions. The nature of these effects, and the manner of their manifestations, it will be the purpose of the following pages to show, especially in Part III, where drugs are discussed individually and in detail.

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## PHARMACY.

**Pharmaceutical Nomenclature and Classification.**—In every science it is necessary to follow some system of naming the objects under consideration, and if this be done carefully it is a great assistance to its study and avoids much confusion. Common names, being used by persons who possess but slight knowledge of the subject, are likely to be frequently misapplied and are not sufficiently distinctive. For instance, nitre may mean sodium carbonate or sodium nitrate, as well as potassium nitrate, which is the proper chemical title. Milk-weed designates any common plant having a milky juice, whereas the name Asclepias tuberosa always serves to identify a species of asclepias, without confusion or error. Scientific names are therefore not adopted with the object of making the study of a subject more difficult to the beginner, but really with the view of making its comprehension more easy after he has mastered the details of its technique and nomenclature. It is absolutely necessary for the student of materia medica to have a knowledge of botanical and chemical terms. In the consideration of drugs in the present work, following the United States Pharmacopœia, every officinal drug appears under the title of its Latin chemical or botanical name, with the letters U. S. P. appended; and the English name or synonym is also given. In the case of plants the full botanical name and natural order are usually stated. The scientific, or botanical, title is given in Latin so as to avoid mistakes, as this is the name by which it would be recognized all over the world, and by which it may easily be identified; whereas, the same common name may be applied to plants of different species having very different physiological actions and medicinal effects. In common language the English name of the remedy is to be used, but in prescriptions the Latin pharmacopœial name should always be employed. Further remarks upon prescription-writing will be found at the end of this section. It is to be understood that throughout these pages the words U. S. P. after the name of a drug, preparation, or formula indicates the fact that it is recognized by the United States Pharmacopœia, and is officinal wherever this authority is acknowledged.

The nomenclature of the United States Pharmacopœia is based upon the following rules adopted by the Convention of 1890 through its Committee on Revision:—

"In the choice of titles of official articles it is recommended that convenience, established custom, and considerations of safety against mistakes through similarity or changes in names, should outweigh purely theoretical considerations or scientific preciseness.

"The Committee was, however, quite prepared to introduce a change in chemical nomenclature, . . . . namely, in the designation of chemical compounds (oxides, salts, etc.), in which it is now customary to put the basylous or metallic component first, viz.: sodium chloride, silver nitrate, lithium bromide, lead oxide, etc., instead of writing chloride of sodium, nitrate of silver, bromide of lithium, oxide of lead, etc. In the case of the salts of iron and mercury this change involved also the use of the respective terms in *ous* and *ic* (ferrous and ferric, mercurous and mercuric) which greatly help to distinguish salts heretofore frequently confounded. As a matter of precaution, however, the distinguishing adjectives, 'corrosive,' 'mild,' 'yellow,' 'red,' etc., have been left in the titles of the respective mercury compounds, for instance, 'Corrosive Mercuric Chloride,' 'Mild Mercurous Chloride,' etc. In the case of complex iron preparations, such as the so-called scale salts (Ferri et Ammonii Citras, Ferri et Ammonii Tartras, etc.) which are not true chemical salts, yet all of which contain the iron in a ferric condition, the word iron was left unchanged, to avoid the impression that they are definite, double salts. In botanical nomenclature, the rules adopted, in 1892, by the Botanical Club of the American Association for the Advancement of Science have been adopted. The rules are as follows:

"1. In nomenclature, the Paris Code of 1867 shall be followed, except where it conflicts with the following:

"I. *The Law of Priority.*—Priority of publication is to be regarded as the fundamental principle of botanical nomenclature.

"2. *Beginning of Botanical Nomenclature.*—The botanical nomenclature genera and species is to begin with the publication of the first edition of Linnæus' *Species Plantarum*, in 1753.

"3. *Stability of Specific Names.*—In the transfer of a species to a genus other than the one under which it was first published, the original specific name is to be retained, unless it is identical with the generic name, or with a specific name previously used in that genus.

"4. *Homonyms.*—The publication of a generic name or of a binomial invalidates the use of the same name for any subsequently published genus, or species, respectively.

"5. *Publication of Genera.*—Publication of a genus consists only (1) in the distribution of a printed description of the genus named; or (2) in the publication of the name of the genus, and the citation of one or more previously published species as examples or types of the genus, with or without a diagnosis.

"6. *Publication of Species.*—Publication of a species consists only (1) in the distribution of a printed description of the species named; or (2) in the publication of a binomial, with reference to a previously published species as a type.

"7. *Similar Generic Names.*—Similar generic names are not to be rejected on account of slight differences, except in spelling of the same word; for example, *Apios* and *Apium* are to be retained, but of *Epidendrum* and *Epidendron*, *Asterocarpus* and *Astrocarpus*, the latter is to be rejected.

"8. *Citation of Authorities.*—In the case of a species which has been transferred from one genus to another, the original author must always be cited in parentheses, followed by the author of the new binomial.

"II. The limitations of genera given in Bentham and Hooker's *Genera Plantarum* shall be followed, except where an obvious error is involved.

"III. In species limitations those authors should be followed whose views appear to us correct."

## PHARMACEUTICAL CLASSES OF REMEDIES.

### ACIDS.

Two degrees of relative concentration are usually recognized, and in one case (acetic acid) there are three. The dilute acids are all of uniform strength,—one-tenth acid and nine-tenths water,—except dilute nitrohydrochloric, which contains only 7 per cent., and dilute acetic, 6 per cent., while aromatic sulphuric acid contains 20 per cent. of the official acid; dilute hydrocyanic acid contains only 2 per cent. of absolute hydrocyanic acid. The official **Acids** are:—

### 1. Inorganic.

(a) *Liquid Acids:—*

| | |
|---|---|
| Acidum hydrobromicum dilutum, | Dose, ♏x–fʒiv. |
| Acidum hydrochloricum, | " ♏iii–x. |
| Acidum hydrochloricum dilutum, | " ♏x–xxx. |
| Acidum hypophorosum dilutum, | " ♏x–lx. |
| Acidum nitricum, | " ♏ii–v. |
| Acidum nitricum dilutum, | " ♏v–xx. |
| Acidum nitrohydrochloricum, | " ♏i–iij. |
| Acidum nitrohydrochloricum dilutum, | " ♏v–xx . |
| Acidum phosphoricum, | " ♏iii–v. |
| Acidum phosphoricum dilutum, | " ♏ii–xx. |
| Acidum sulphuricum, | " ♏i–iij. |
| Acidum sulphuricum dilutum, | " ♏v–xv. |
| Acidum sulphuricum aromaticum, | " ♏x–xx. |
| Acidum sulphurosum, | " ♏v–fʒj. |

(b) *Solid Acids:—*

| | |
|---|---|
| Acidum arsenosum | " gr. $\frac{1}{30}$–$\frac{1}{12}$. |
| Acidum boricum, | " gr. v–xxx. |
| Acidum chromicum, | " gr. $\frac{1}{30}$–$\frac{1}{4}$. |

### 2. Organic.

(a) *LiquidAcids:—*

| | |
|---|---|
| Acidum aceticum glaciale, | External use. |
| Acidum aceticum, | Dose, ♏v–x. |
| Acidum aceticum dilutum, | " fʒi–ij. |
| Acidum carbolicum crudum, | External use. |
| Acidum hydrocyanicum dilutum, | Dose, ♏i–v. |
| Acidum lacticum, | " ♏xx-fʒss. |
| Acidum oleicum, | External use. |

(b) *Solid Acids:—*

| | |
|---|---|
| Acidum benzoicum, | Dose, gr. x–xxx. |
| Acidum carbolicum,* | " gr. ss–ij. |
| Acidum citricum, | " gr. x–xxx. |
| Acidum gallicum, | " gr. ii–x. |
| Acidum salicylicum, | " gr. x–ʒj. |
| Acidum stearicum, | External use. |
| Acidum tannicum, | Dose, gr. i–xx. |
| Acidum tartaricum, | " gr. v–xx. |

The official **Alkaloids** are:—

| | |
|---|---|
| Apomorphinæ hydrochloras, | Dose, gr. $\frac{1}{16}$–$\frac{1}{4}$. |
| Atropina, | " gr. $\frac{1}{200}$–$\frac{1}{60}$. |
| Atropinæ sulphas, | " gr. $\frac{1}{200}$–$\frac{1}{60}$. |
| Caffeina, | " gr. ii–x. |
| Caffeina citrata | " gr. ij–v. |
| Caffeina citrata effervescens | " ʒi–iij. |
| Chinoidinum, | " gr. iij–xxx. |
| Cinchonidinæ sulphas, | " gr. v–xl. |
| Cinchonina, | " gr. v–xxx. |
| Cinchoninæ sulphas, | " gr. v–xxx. |
| Cocainæ hydrochloras, | " gr. ss–ij. |
| Codeina, | " gr. $\frac{1}{6}$–ij. |
| Hydrastininæ hydrochloras, | " gr. $\frac{8}{8}$ |
| Hyoscinæ hydrobromas | " gr. $\frac{1}{150}$–$\frac{1}{100}$. |
| Hyoscyaminæ hydrobromas, | " gr. $\frac{1}{64}$–$\frac{1}{32}$ |
| Hyoscyaminæ sulphas, | " gr. $\frac{1}{60}$–$\frac{1}{32}$. |
| Morphina, | " gr. $\frac{1}{10}$–$\frac{1}{2}$. |

---

* As carbolic acid melts at the temperature of the human body, it may be prescribed in minims or drops as well as in grains.

| | |
|---|---|
| Morphinæ acetas, | Dose, gr. $\frac{1}{6}$–$\frac{1}{2}$. |
| Morphinæ hydrochloras, | “ gr. $\frac{1}{6}$–$\frac{1}{2}$. |
| Morphinæ sulphas, | “ gr. $\frac{1}{6}$–$\frac{1}{2}$. |
| Physostigminæ salicylas, | “ gr. $\frac{1}{64}$–$\frac{1}{20}$. |
| Physostigminæ sulphas, | “ gr. $\frac{1}{100}$–$\frac{1}{60}$. |
| Pilocarpinæ hydrochloras, | “ gr. $\frac{1}{12}$–$\frac{1}{3}$. |
| Piperina, | “ gr. ss–x. |
| Quinidinæ sulphas, | “ gr. v–xxx. |
| Quinina, | “ gr. i–ʒj. |
| Quininæ bisulphas, | “ gr. i–xv. |
| Quininæ hydrobromas, | “ gr. i–xx. |
| Quininæ hydrochloras, | “ gr. i–xv. |
| Quininæ sulphas, | “ gr. i–ʒj. |
| Quininæ valerianas, | “ gr. i–xx. |
| Sparteinæ sulphas, | “ gr. $\frac{1}{8}$–j. |
| Strychnina, | “ gr. $\frac{1}{60}$–$\frac{1}{20}$. |
| Strychninæ sulphas, | “ gr. $\frac{1}{60}$–$\frac{1}{20}$. |
| Veratrina, | “ gr. $\frac{1}{30}$–$\frac{1}{12}$. |

Under the appropriate headings, mention will be made of many other alkaloids which are not official in the United States Pharmacopœia.

### NEUTRAL PRINCIPLES.

| | |
|---|---|
| Chrysarobinum, | Dose, gr. $\frac{1}{8}$–xx. |
| Elaterinum, | “ gr. $\frac{1}{20}$–$\frac{1}{12}$. |
| Glycyrrhizinum ammoniatum, | “ gr. v. |
| Picrotoxinum, | “ gr. $\frac{1}{120}$–$\frac{1}{60}$. |
| Salicinum, | “ gr. x–ʒij. |
| Santoninum, | “ gr. i–iv. |

## OILS.

### 1. EXPRESSED OR FIXED OILS.

| | |
|---|---|
| Oleum adipis, | External use. |
| Oleum amygdalæ expressum, | Dose, fʒii–iv. |
| Oleum gossypii seminis, | External use. |
| Oleum lini, | External use. |
| Oleum morrhuæ, | Dose, fʒi–iv. |
| Oleum olivæ, | “ f℥ij. |
| Oleum phosphoratum, | “ ♏i–v. |
| Oleum ricini, | “ fʒi–f℥j. |
| Oleum sesami, | External use. |
| Oleum theobromatis, | External use. |
| Oleum tiglii, | Dose, ♏$\frac{1}{4}$–ij. |

### 2. DISTILLED OR VOLATILE OILS.

| | |
|---|---|
| Oleum æthereum, | Dose, ♏ij. |
| Oleum amygdalæ amaræ, | “ ♏$\frac{1}{4}$–j. |
| Oleum anisi, | “ ♏v–x. |
| Oleum aurantii corticis, | In pharmacy. |
| Oleum aurantii florum, | In pharmacy. |
| Oleum bergamottæ, | In pharmacy. |
| Oleum cajuputi, | Dose, ♏i–v. |
| Oleum cari, | “ ♏i-v. |
| Oleum caryophylli, | “ ♏i–vj. |
| Oleum chenopodii, | “ ♏v–xx. |
| Oleum cinnamomi, | “ ♏i–iij. |
| Oleum copaibæ, | “ ♏v–x. |
| Oleum coriandri, | “ ♏i–v. |

| | |
|---|---|
| Oleum cubebæ, | Dose, ♏v–xij. |
| Oleum erigerontis, | “ ♏xx–xxx. |
| Oleum eucalypti, | “ ♏iij–xx. |
| Oleum fœniculi, | “ ♏v–xv. |
| Oleum gaultheriæ, | “ ♏ii–xx. |
| Oleum hedeomæ, | “ ♏ii–x. |
| Oleum juniperi, | “ ♏v–xx. |
| Oleum lavandulæ florum, | In pharmacy. |
| Oleum limonis, | In pharmacy. |
| Oleum menthæ piperitæ, | Dose, ♏i–v. |
| Oleum menthæ viridis, | “ ♏ii–v. |
| Oleum myrciæ, | “ ♏ij. |
| Oleum myristicæ, | “ ♏i–v. |
| Oleum picis liquidæ, | “ ♏ij. |
| Oleum pimentæ, | Dose, ♏iii–v. |
| Oleum rosæ, | In pharmacy. |
| Oleum rosmarini, | Dose, ♏i–v. |
| Oleum sabinæ, | “ ♏ii–v. |
| Oleum santali, | “ ♏v–x. |
| Oleum sassafras, | “ ♏i–iv. |
| Oleum sinapis volatile, | In liniment. |
| Oleum terebinthinæ, | Dose, ♏v–xv. |
| Oleum thymi, | “ ♏i–ij. |

## PREPARATIONS.

The pharmacopœia presents thirty-three classes of official preparations:—

| | *Latin.* | | | *English.* |
|---|---|---|---|---|
| 1. | Acetum. | (Gen. sing., *i* | Gen. pl., *a* ) | Vinegar. |
| 2. | Aqua. | ( “ “ *æ* | “ “ *æ* ) | Water (aromatic). |
| 3. | Ceratum. | ( “ “ *i* | “ “ *a* ) | Cerate. |
| 4. | Charta. | ( “ “ *æ* | “ “ *æ* ) | Paper. |
| 5. | Collodium. | ( “ “ *i* | “ “ *a* ) | Collodion. |
| 6. | Confectio. | ( “ “ *onis* | “ “ *ones* ) | Confection. |
| 7. | Decoctum. | ( “ “ *i* | “ “ *a* ) | Decoction. |
| 8. | Elixir. | ( not declinable | ) | Elixir (cordial). |
| 9. | Emplastrum. | (Gen. sing., *i* | Gen. pl., *a* ) | Plaster. |
| 10. | Extractum. | ( “ “ *i* | “ “ *a* ) | Extract. |
| 11. | Extractum fluidum. | ( “ “ *i* | “ “ *a* ) | Fluid extract. |
| 12. | Glyceritum. | ( “ “ *i* | “ “ *a* ) | Glycerite. |
| 13. | Infusum. | ( “ “ *i* | “ “ *a* ) | Infusion. |
| 14. | Linimentum. | ( “ “ *i* | “ “ *a* ) | Liniment. |
| 15. | Liquor. | ( “ “ *oris* | “ “ *ores* ) | Solution. |
| 16. | Massa. | ( “ “ *æ* | “ “ *æ* ) | (Pill) Mass. |
| 17. | Mel. | ( “ “ *lis* | “ “ *lita* ) | Honey. |
| 18. | Mistura. | ( “ “ *æ* | “ “ *æ* ) | Mixture. |
| 19. | Mucilago. | ( “ “ *inis* | “ “ *ines* ) | Mucilage. |
| 20. | Oleatum. | ( “ “ *i* | “ “ *a* ) | Oleate. |
| 21. | Oleoresina. | ( “ “ *æ* | “ “ *æ* ) | Oleoresin. |
| 22. | Pilula. | ( “ “ *æ* | “ “ *æ* ) | Pill. |
| 23. | Pulvis. | ( “ “ *eris* | “ “ *eres* ) | Powder. |
| 24. | Resina. | ( “ “ *æ* | “ “ *æ* ) | Resin. |
| 25. | Spiritus. | ( “ “ *us* | “ “ *us* ) | Spirit. |
| 26. | Suppositorium. | ( “ “ *i* | “ “ *a* ) | Suppository. |
| 27. | Syrupus. | ( “ “ *i* | “ “ *i* ) | Syrup. |
| 28. | Tinctura. | ( “ “ *æ* | “ “ *æ* ) | Tincture. |
| 29. | Tinctura herbarum recentium.* | ( “ “ *æ* | “ “ *æ* ) | Tincture of fresh herbs. |

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* The last two words are not changed.

| | | |
|---|---|---|
| 30. Trituratio. | (Gen. sing., *onis* Gen. pl., *ones*) | Trituration. |
| 31. Trochiscus. | ( " " *i* " " *i* ) | Troche (lozenge). |
| 32. Unguentum. | ( " " *i* " " *a* ) | Ointment. |
| 33. Vinum. | ( " " *i* " " *a* ) | Wine. |

**Aceta, or Vinegars** (2).—Liquid preparations made with vinegar or dilute acetic acid. Strength, 10 per cent.

Acetum opii.
Acetum scillæ.

**Aquæ, or Aromatic Waters** (18).—Watery solutions of volatile substances, formerly prepared by distillation, now commonly made by adding the volatile or essential oil to distilled water, with magnesia and filtering. They are generally used as flavoring agents, and the dose is indefinite, except aqua ammoniæ, chlori and creasoti. Aquæ destillata is pure, recently distilled water.

Aqua destillata.
Aqua ammoniæ.
Aqua ammoniæ fortior.
Aqua amygdalæ amaræ.
Aqua anisi.
Aqua aurantii florum.
Aqua aurantii florum fortior.
Aqua camphoræ.
Aqua chlori.
Aqua chloroformi.
Aqua cinnamomi.
Aqua creasoti.
Aqua fœniculi.
Aqua hydrogenii dioxidi.
Aqua menthæ piperitæ.
Aqua menthæ viridis.
Aqua rosæ.
Aqua rosæ fortior.

**Cerata, or Cerates** (6).—Fatty mixtures, containing wax, so as to make them firmer than ordinary ointments.

Ceratum.
Ceratum camphoræ.
Ceratum cantharidis.
Ceratum cetacei.
Ceratum plumbi subacetatis.
Ceratum resinæ.

**Chartæ, or (Medicated) Papers** (2).—Papers of definite size treated with drugs.

Charta potassii nitratis.
Charta sinapis.

**Collodia, or Collodions** (4).—Liquid preparations of collodion:—

Collodium.
Collodium cantharidatum.
Collodium flexile.
Collodium stypticum.

**Confectiones, or Confections** (2).—Soft, solid preparations made into a paste with sugar.

Confectio rosæ.
Confectio sennæ.

**Decocta, or Decoctions** (2).—Liquid preparations of vegetable drugs obtained by boiling with water. A decoction is directed to be made, as a rule, by placing the drug in a suitable vessel, with a cover, and adding 100 parts of cold water for each 10 of substance used, covering it well, and boiling for fifteen minutes. When cool, it is passed through the strainer, adding enough cold water to bring up the product to 100 parts. The strength of decoctions of energetic or powerful drugs should be specially prescribed by the physician. The decoctum cetrariæ is only 5 per cent.

Decoctum cetrariæ.
Decoctum sarsaparillæ compositum.

**Elixir, or Elixirs** (2).—The popularity of this class of remedies is due to their comparatively pleasant taste and to the fact that they contain alcohol and sugar.

Elixir aromaticum.
Elixir phosphori.

**Emplastra, or Plasters** (13).—Solid substances rendered soft and adhesive by heat, so as to be spread upon leather or muslin, of any desired size or shape, for application to the surface of the body to which the plaster is intended to adhere. One is an exception to the general rule that plasters are to be applied with heat; the emplastrum ichthyocollæ, or isinglass-plaster (court-plaster), is rendered adhesive by moisture.

Emplastrum ammoniaci cum hydrargyro.
Emplastrum arnicæ.
Emplastrum belladonnæ.
Emplastrum capsici.
Emplastrum ferri.
Emplastrum hydrargyri.
Emplastrum ichthyocollæ.
Emplastrum opii.
Emplastrum picis Burgundicæ.
Emplastrum picis cantharidatum.
Emplastrum plumbi.
Emplastrum resinæ.
Emplastrum saponis.

**Extracta, or Extracts** (33).—Preparations of a solid or semi-solid consistency, containing the active principles or constituents of drugs, obtained usually by evaporation of alcoholic or watery solutions, the strength being from twice to four times that of the officinal agent from which they are made. They often contain glycerin, to keep them in a condition to readily make into pills. **Assayed extracts** contain a definite proportion of the active ingredient, determined by chemical analysis. Alcoholic extracts, aqueous extracts, acetic extracts, and ethereal extracts are made with the aid of dilute alcohol, water, acetic acid, or ether. Many so-called active principles, such as leptandrin, macrotin, hydrastin, etc., of botanic physicians, are simply alcoholic extracts, or impure resins, precipitated by the addition of water.

Extractum aconiti.
Extractum aloës.
Extractum arnicæ radicis.
Extractum belladonnæ foliorum alcoholicum.
Extractum cannabis Indicæ.
Extractum cimicifugæ.
Extractum cinchonæ.
Extractum colchici radicis.
Extractum colocynthidis.
Extractum colocynthidis compositum.
Extractum conii.
Extractum digitalis.
Extractum ergotæ.
Extractum euonymi.
Extractum gentianæ.
Extractum glycyrrhizæ.
Extractum glycyrrhizæ purum.
Extractum hæmatoxyli.
Extractum hyoscyami.
Extractum iridis.
Extractum jalapæ.
Extractum juglandis.
Extractum krameriæ.
Extractum leptandræ.
Extractum nucis vomicæ.
Extractum opii.
Extractum physostigmatis.
Extractum podophylli.
Extractum quassiæ.
Extractum rhei.
Extractum stramonii seminis.
Extractum taraxaci.
Extractum uvæ ursi.

**Extracta Fluida, or Fluid Extracts** (88).—Liquid preparations representative of organic drugs, usually alcoholic, or hydro-alcoholic and, consequently, equivalent to strong tinctures. The rule was adopted at the revision of 1880, of having these preparations of definite strength, as related to the crude drug, so that one cubic centimetre of the fluid extract represents the active principle of one gramme of the drug.* The dose, therefore, is the same in minims as that of the dry, powdered drug in grains.

Extractum aconiti fluidum.
Extractum apocyni fluidum.
Extractum arnicæ radicis fluidum.
Extractum aromaticum fluidum.
Extractum asclepiadis fluidum.
Extractum aspidospermatis fluidum.
Extractum aurantii amari fluidum.
Extractum belladonnæ radicis fluidum.
Extractum buchu fluidum.
Extractum calami fluidum.
Extractum calumbæ fluidum.
Extractum cannabis Indicæ fluidum.
Extractum capsici fluidum.
Extractum castaneæ fluidum.
Extractum chimaphilæ fluidum.
Extractum chiratæ fluidum.
Extractum cimicifugæ fluidum.
Extractum cinchonæ fluidum.
Extractum cocæ fluidum.
Extractum colchici radicis fluidum.
Extractum colchici seminis fluidum.
Extractum conii fluidum.
Extractum convallariæ fluidum.
Extractum cubebæ fluidum.
Extractum cusso fluidum.
Extractum cypripedii fluidum.
Extractum digitalis fluidum.
Extractum dulcamaræ fluidum.
Extractum ergotæ fluidum.
Extractum eryodictyi fluidum.
Extractum eucalypti fluidum.
Extractum eupatorii fluidum.
Extractum frangulæ fluidum.
Extractum gelsemii fluidum.
Extractum gentianæ fluidum.
Extractum geranii fluidum.
Extractum glycyrrhizæ fluidum.
Extractum gossypii radicis fluidum.
Extractum grindelia fluidum.
Extractum guaranæ fluidum.
Extractum hamamelidis fluidum.
Extractum hydrastis fluidum.
Extractum hyoscyami fluidum.
Extractum ipecacuanhæ fluidum.
Extractum iridis fluidum.
Extractum krameriæ fluidum,
Extractum lappæ fluidum.
Extractum leptandræ fluidum.
Extractum lobeliæ fluidum.
Extractum lupulini fluidum.
Extractum matico fluidum.
Extractum menispermi fluidum.
Extractum mezerei fluidum.
Extractum nucis vomicæ fluidum.
Extractum pareiræ fluidum.
Extractum phytolaccæ radicis fluidum.
Extractum pilocarpi fluidum.
Extractum podophylli fluidum.
Extractum pruni Virginianæ fluidum.
Extractum quassiæ fluidum.
Extractum rhamni purshianæ fluidum.
Extractum rhei fluidum.
Extractum rhois glabræ fluidum.
Extractum rosæ fluidum.
Extractum rubi fluidum.
Extractum rumicis fluidum.
Extractum sabinæ fluidum.
Extractum sanguinariæ fluidum.
Extractum sarsaparillæ fluidum.
Extractum sarsaparillæ fluidum compositum.
Extractum scillæ fluidum.
Extractum scoparii fluidum.
Extractum scutellariæ fluidum.
Extractum senegæ fluidum.
Extractum sennæ fluidum.
Extractum serpentariæ fluidum.
Extractum spigeliæ fluidum.
Extractum stillingiæ fluidum.
Extractum stramonii fluidum.
Extractum taraxaci fluidum.
Extractum tritici fluidum.
Extractum uvæ ursi fluidum.
Extractum valerianæ fluidum.
Extractum veratri viridis fluidum.
Extractum viburni opuli fluidum.
Extractum viburni prunifolii fluidum.
Extractum xanthoxyli fluidum.
Extractum zingiberis fluidum.

**Glycerita, Glycerites** (2).—In these preparations glycerin is the vehicle for medicinal substances. The U. S. Pharmacopœia only recognizes two of this class of preparations, both without much efficacy by themselves, which may be used as excipients or vehicles for powders or other remedies. Glycerin is also a good solvent for some agents, such as pepsin, and preparations of this kind are sold as glycerites, glyceroles, or glycerins.

Glyceritum amyli.
Glyceritum vitelli.

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* In order to insure absolute uniformity of strength in the product, it is evident that the crude drug must be assayed and standardized before making the extract. This is accomplished in a series of fluid extracts which, on account of their standard strength, have been named Normal Liquids. These are made from selected drugs, and are ideal fluid extracts.

**Infusa, or Infusions** (4).—These are preparations usually made by pouring boiling water upon vegetable drugs and allowing them to stand for two hours in a warm place, then separating the infusion from the dregs by straining. When the strength is not otherwise directed by the pharmacopœia or by the prescription of a physician, they are to be made 10-per-cent. strength. The infusions of cinchona and of prunus Virginianæ are made with cold water, by percolation. The officinal ones are:—

Infusum cinchonæ.
Infusum digitalis.
Infusum pruni Virginianæ.
Infusum sennæ compositum.

**Linimenta, or Liniments** (9).—Preparations, oily or alcoholic, or both, containing medicinal substances, and intended for external application to the surface of the body, with friction.

Linimentum ammoniæ.
Linimentum belladonnæ.
Linimentum calcis.
Linimentum camphoræ.
Linimentum chloroformi.
Linimentum saponis.
Linimentum saponis mollis.
Linimentum sinapis compositum.
Linimentum terebinthinæ.

**Liquors, or Solutions** (24).—Liquid preparations of non-volatile drugs, generally chemicals, which are wholly soluble in the menstruum employed.

Liquor acidi arsenosi.
Liquor ammonii acetatis.
Liquor arseni et hydrargyri iodidi.
Liquor calcis.
Liquor ferri acetatis.
Liquor ferri chloridi.
Liquor ferri citratis.
Liquor ferri et ammonii acetatis.
Liquor ferri nitratis.
Liquor ferri subsulphatis.
Liquor ferri tersulphatis.
Liquor hydrargyri nitratis.
Liquor iodi compositus.
Liquor magnesii citratis.
Liquor plumbi subacetatis.
Liquor plumbi subacetatis dilutus.
Liquor potassæ.
Liquor potassii arsenitis.
Liquor potassii citratis.
Liquor sodæ.
Liquor sodæ chloratæ.
Liquor sodii arsenatis.
Liquor sodii silicatis.
Liquor zinci chloridi.

**Massæ, or Masses** (3).—These are soft, solid mixtures of proper consistency to be made into pills.

Massa copaibæ.
Massa ferri carbonatis.
Massa hydrargyri.

**Mellita, or Honeys** (3).—Liquid preparations consisting of honey, or honey as a basis.

Mel.
Mel despumatum.
Mel rosæ.

**Misturæ, or Mixtures** (4).—Preparations consisting of a liquid used as a vehicle, and containing an agent not soluble in the menstruum employed.

Mistura cretæ.
Mistura ferri composita.
Mistura glycyrrhizæ composita.
Mistura rhei et sodæ.

**Mucilagines, or Mucilages** (4).—These are rather dense, viscid preparations of gum or mucilaginous substances, dissolved in water. They are used for suspending insoluble powders or emulsifying oily substances.

Mucilago acaciæ.
Mucilago sassafras medullæ.
Mucilago tragacanthæ.
Mucilago ulmi.

**Oleata, or Oleates** (3).—The official oleates are made by dissolving medicinal bases in oleic acid, and are in the form of a soft solid or ointment. Some of the non-official oleates are in the form of dry powder. The official oleates are:—

Oleatum hydrargyri.
Oleatum veratrinæ.
Oleatum zinci.

**Oleoresinæ, or Oleoresins** (6).—These are liquid preparations obtained by dissolving oily and resinous matters out of vegetable drugs by means of stronger ether, and afterward evaporating the ether. Benzin is sometimes substituted for the solvent required by the pharmacopœia. Oleoresins differ from fluid extracts in composition and in strength, being the most concentrated liquid preparations of drugs that are produced. The yield of oleoresin naturally varies, according to the quality of the crude drug, this class of remedies not bearing a uniform relation (of gramme to cubic centimetre), as fluid extracts are required to do. Fluid extracts often contain matters insoluble in ether.

Oleoresina aspidii.
Oleoresina capsici.
Oleoresina cubebæ.
Oleoresina lupulini.
Oleoresina piperis.
Oleoresina zingiberis.

**Pilulæ, or Pills** (15).—Small, spherical masses of medicinal substances, intended to be swallowed whole; two of the official forms are coated with tolu (pilulæ ferri iodidi and pilulæ phosphori); the rest are simply treated with dusting-powder. It is the rule among manufacturers also to supply a full line of pills coated with gelatin or with sugar, in order to preserve and render them more pleasant to swallow. Sometimes a coating of keratin is used where it is desired that pills should not be dissolved until reaching the intestinal tract.

Pilulæ aloës.
Pilulæ aloës et asafœtidæ.
Pilulæ aloës et ferri.
Pilulæ aloës et mastiches.
Pilulæ aloës et myrrhæ.
Pilulæ antimonii compositæ.
Pilulæ asafœtidæ.
Pilulæ catharticæ compositæ.
Pilulæ catharticæ vegitabiles.
Pilulæ ferri carbonatis.
Pilulæ ferri iodidi.
Pilulæ opii.
Pilulæ phosphori.
Pilulæ rhei.
Pilulæ rhei compositæ.

**Pulveres, or Powders** (9).—Drugs in a dry, finely divided form, generally compounded or mixed.

Pulvis antimonialis.
Pulvis aromaticus.
Pulvis cretæ compositus.
Pulvis effervescens compositus.
Pulvis glycyrrhizæ compositus.
Pulvis ipecacuanhæ et opii.
Pulvis jalapæ compositus.
Pulvis morphinæ compositus.
Pulvis rhei compositus.

**Resinæ, or Resins** (5).—Solid preparations of vegetable origin, obtained by extracting with alcohol and precipitating with water, or by distilling the volatile oil from an oleoresin.

Resina (from turpentine).
Resina copaibæ.
Resina jalapæ.
Resina podophylli.
Resina scammonii.

**Spiritus, or Spirits** (25).—These are solutions of volatile or aromatic substances, in which alcohol is the menstruum.

Spiritus ætheris.
Spiritus ætheris compositus.
Spiritus ætheris nitrosi.
Spiritus ammoniæ.
Spiritus ammoniæ aromaticus.
Spiritus amygdalæ amaræ.
Spiritus anisi.
Spiritus aurantii.
Spiritus aurantii compositus.
Spiritus camphoræ.
Spiritus chloroformi.
Spiritus cinnamomi.
Spiritus frumenti.
Spiritus gaultheriæ.
Spiritus glonoini.
Spiritus juniperi.
Spiritus juniperi compositus.
Spiritus lavandulæ.
Spiritus limonis.
Spiritus menthæ piperitæ.
Spiritus menthæ viridis.
Spiritus myrciæ.
Spiritus myristicæ.
Spiritus phosphori.
Spiritus vini gallici.

**Suppositoria, or Suppositories** (1).—Only one formula for suppositories is now official, but they are directed to be made extemporaneously by incorporating the medicinal substance with cacao-butter (oleum theobromatis) and shaping them with a mold into small, conical masses, weighing 15 grains each, unless otherwise directed. They are intended to be inserted into the rectum and other cavities of the body, where they melt and allow the medicament to come into contact with an absorbing surface. Suppositories of soap and glycerin are largely used as laxatives to empty the lower bowel. Similar preparations of cacao-butter or gelatin for the urethra or nose are called bougiæ, or buginaria.

Suppositoria glycerini.

**Syrupi, or Syrups** (32).—These popular preparations are strong solutions of sugar in water, containing flavoring and medicinal substances. They are usually made with the aid of heat, for convenience, but where heat would be injurious, they are directed to be made by stirring and filtering, or by percolation.

Syrupus.
Syrupus acaciæ.
Syrupus acidi citrici.
Syrupus acidi hydriodici.
Syrupus allii.
Syrupus althææ.
Syrupus amygdalæ.
Syrupus aurantii.
Syrupus aurantii florum.
Syrupus calcii lactophosphatis.
Syrupus calcis.
Syrupus ferri iodidi.
Syrupus ferri, quininæ et strychninæ phosphatum.
Syrupus hypophosphitum.
Syrupus hypophosphitum cum ferro.
Syrupus ipecacuanhæ.
Syrupus krameriæ.
Syrupus lactucarii.
Syrupus picis liquidæ.
Syrupus pruni Virginianæ.
Syrupus rhei.
Syrupus rhei aromaticus.
Syrupus rosæ.
Syrupus rubi.
Syrupus rubi idæi.
Syrupus sarsaparillæ compositus.
Syrupus scillæ.
Syrupus scillæ compositus.
Syrupus senegæ.
Syrupus sennæ.
Syrupus tolutanus.
Syrupus zingiberis.

**Tincturæ, or Tinctures** (71).—Liquid preparations of vegetable drugs differing from spirits in not containing volatile substances. (To this, tinctura iodi, lavandulæ compositæ, and moschi are exceptions.)

Tinctura aconiti.
Tinctura aloës.
Tinctura aloës et myrrhæ.
Tinctura arnicæ florum.
Tinctura arnicæ radicis.
Tinctura asafœtidæ.
Tinctura aurantii amari.
Tinctura aurantii dulcis.
Tinctura belladonnæ foliorum.
Tinctura benzoini.
Tinctura benzoini composita.
Tinctura bryoniæ.
Tinctura calendulæ.
Tinctura calumbæ.
Tinctura cannabis Indicæ.
Tinctura cantharidis.
Tinctura capsici.
Tinctura cardamomi.
Tinctura cardamomi composita.
Tinctura catechu composita.

Tinctura ferri chloridi.
Tinctura chiratæ.
Tinctura cimicifugæ.
Tinctura cinchonæ.
Tinctura cinchonæ composita.
Tinctura cinnamomi.
Tinctura colchici seminis.
Tinctura croci.
Tinctura cubebæ.
Tinctura digitalis.
Tinctura gallæ.
Tinctura gelsemii.
Tinctura gentianæ composita.
Tinctura guaici.
Tinctura guaica ammoniata.
Tinctura humili.
Tinctura hydrastis.
Tinctura hyoscyami.
Tinctura iodi.
Tinctura ipecacuanhæ et opii.
Tinctura kino.
Tinctura krameriæ.
Tinctura lactucarii.
Tinctura lavandulæ composita.
Tinctura lobeliæ.
Tinctura matico.
Tinctura moschi.
Tinctura myrrhæ.
Tinctura nucis vomicæ.
Tinctura opii.
Tinctura opii camphorata.
Tinctura opii deodorati.
Tinctura physostigmatis.
Tinctura pyrethri.
Tinctura quassiæ.
Tinctura quillaiæ.
Tinctura rhei.
Tinctura rhei aromatica.
Tinctura rhei dulcis.
Tinctura sanguinariæ.
Tinctura scillæ.
Tinctura serpentariæ.
Tinctura stramonii seminis.
Tinctura strophanthi.
Tinctura sumbul.
Tinctura tolutana.
Tinctura valerianæ.
Tinctura valerianæ ammoniata.
Tinctura vanillæ.
Tinctura veratri viridis.
Tinctura zingiberis.

**Tinctura Herbarum Recentium, or Tinctures of Fresh Herbs,** are directed by the pharmacopœia to be made of 50 parts of the fresh herb, macerated in 100 parts of alcohol for two weeks, and then filtering the product. No special formulæ are given.

**Triturationes, or Triturations (1).**—This is a newly recognized class of preparations, which represent one-tenth the strength of the crude drug, to every 10 parts of which 90 of sugar of milk are added, and the mixture thoroughly incorporated by trituration. The only official represenative is

Trituratio elaterini.

**Trochisci, or Troches (15).**—Small, flattened, disk-like, solid masses, usually called lozenges. The basis is generally gum and sugar, making a mass which can be slowly dissolved in the mouth, thus medicating the mucous membrane of the mouth and throat.

Trochisci acidi tannici.
Trochisci ammonii chloridi.
Trochisci catechu.
Trochisci cretæ.
Trochisci cubebæ.
Trochisci ferri.
Trochisci glycyrrhizæ et opii.
Trochisci ipecacuanhæ.
Trochisci krameriæ.
Trochisci menthæ piperitæ.
Trochisci morphinæ et ipecacuanhæ.
Trochisci potassii chloratis.
Trochisci santonini.
Trochisci sodii bicarbonatis.
Trochisci zingiberis.

**Unguenta, or Unguents (23).**—Soft, fatty preparations, melting at the temperature of the body, and suitable for inunction and the administration of remedies by external application and friction.

Unguentum.
Unguentum acidi carbolici.
Unguentum acidi tannici.
Unguentum aquæ rosæ.
Unguentum belladonnæ.
Unguentum chrysarobini.
Unguentum diachylon.
Unguentum gallæ.
Unguentum hydrargyri.
Unguentum hydrargyri ammoniati.
Unguentum hydrargyri nitratis.
Unguentum hydrargyri oxidi flavi.
Unguentum hydrargyri oxidi rubri.
Unguentum iodi.
Unguentum iodoformi.
Unguentum picis liquidæ.
Unguentum plumbi carbonatis.
Unguentum plumbi iodidi.
Unguentum potassii iodidi.
Unguentum stramonii.
Unguentum sulphuris.
Unguentum veratrinæ.
Unguentum zinci oxidi.

**Vina, or Wines** (10).—Alcoholic preparations in which stronger white wine is the menstruum generally employed.

Vinum album.
Vinum antimonii.
Vinum colchici radicis.
Vinum colchici seminis.
Vinum ergotæ.
Vinum ferri amarum.
Vinum ferri citratis.
Vinum ipecacuanhæ.
Vinum opii.
Vinum rubrum.

The doses of the preceding preparations are to be found under their respective headings, and also in a table of doses at the end of the work. An introductory section will also be found to Part II, in which Classification of Remedies is considered, with definitions and descriptions of the various classes of medicinal agents employed in modern therapeutics.

## PHARMACEUTICAL PROCESSES, OR PHARMACY PROPER.

**Pharmacy** is that department of medical science which is devoted to the collection, identification, manipulation, compounding and dispensing of drugs. It comprises the various articles and preparations composing the Materia Medica, *official* and non-*official*, guards against adulteration and substitution, analyzes the composition and determines the standard proportion of active constituents, besides providing eligible and efficient preparations, and indicating the proper procedures in filling prescriptions *secundum artem.* A knowledge of at least the rudiments of pharmacy is absolutely necessary to the practising physician. It is a great misfortune that so many students are permitted to graduate from our medical schools with such an imperfect acquaintance with practical pharmacy as they ordinarily possess. Owing to ignorance on the part of the prescriber serious mistakes may be made, to the detriment of the patient and discredit of the physician.

In practical pharmacy a number of preparations known as favorite prescriptions or popular remedies, like Squibb's Cholera Mixture, Lafayette Mixture, etc., being in frequent demand, are usually kept on hand in the shops. Some of these, like Brown Mixture, Compound Licorice Lozenges, and Basham's Mixture, have been admitted to the pharmacopœia. Others are less often prescribed, but the pharmacist is expected to have the formula at hand so as to prepare the remedy extemporaneously. Such a collection of formulæ is known as the "Extra Pharmacopœia," or simply as a Formulary. Several such formularies exist, the best known being Griffith's. Some years ago the American Pharmaceutical Association appointed a committee to collect the formulæ for such *unofficial* preparations and to select the best of each class, so as to form a National Formulary. This was done, and the result of the committee's work was fully approved by the American Pharmaceutical Association. The work was issued for the purpose of obtaining uniformity in *unofficial* compounds, and to publish formulæ which represents some proprietary preparations. A Physicians' Manual of the National Formulary is published in Chicago, by C. S. Hallberg, at a trifling cost. Every physician should have at hand for reference the United States Pharmacopœia and the National Formulary.

The principal operations of pharmacy will now be systematically, though briefly, considered.* They are:—

1. Weighing and Measuring.
2. Determination of Specific Gravity and Temperature.
3. Operations Requiring the Use of Heat.
4. Operations Chiefly Mechanical.
5. Pharmaceutical Testing and Analysis.
6. Extemporaneous Preparations.

**1. Weighing and Measuring.**—Solids are usually weighed and liquids measured; the denser liquids, however, are often, for the sake of accuracy, dispensed by weight, and all liquids might be. Owing, however, to the variation in bulk of liquids, and the necessity of making corrections for specific gravity and temperature, this plan is not employed in prescribing, although parts by weight have been adopted in our pharmacopœia, except in the fluid extracts, which are made after the metric system. Scales, or balances, of various kinds and varying degrees of accuracy, are employed in weighing, and care should be used that scales used in compounding prescriptions are reliable and sufficiently sensitive for the purpose for which they are used.

Weight is the measure or expression of the attraction of gravitation for a given mass of matter at the earth's surface, being dependent principally upon its bulk, density, and physical condition. The comparative bulk of bodies is expressed in terms of dimension or measurement. Standards of weight and measure are established by law in all civilized countries. Those in use in the United States have been adopted by Act of Congress of June 14, 1836, when the Secretary of the Treasury was directed to furnish each State in the Union with a complete set of revised standards based upon those of Great Britain. In 1864 the use of what is known as the metric system was legalized in Great Britain, but was not made compulsory; and in 1866 the United States pursued the same course. It was partially introduced into the pharmacopœia in the revision of 1880. The measures in use in buying or selling drugs and compounding prescriptions are as follow: Troy and Avoirdupois weights for ascertaining the relative ponderosity of bodies; Wine, or Imperial measure for quantity of liquids, and the metric system.

Troy, or Apothecaries', weight is used for compounding or dispensing drugs; avoirdupois is the standard for commercial purposes, and is used in buying and selling drugs in quantity.

*Troy, or Apothecaries' Weight.*

| | |
|---|---|
| 20 grains (symbol gr.) . . . . | equal 1 scruple (symbol ℈). |
| 60 grains, or 3 scruples, . . . | equal 1 drachm (symbol ʒ). |
| 480 grains, or 8 drachms, . . . | equal 1 ounce (symbol ℥). |
| 5760 grains, or 12 ounces, . . . | equal 1 pound (symbol ℔ Troy). |

*Avoirdupois Weight.*

| | |
|---|---|
| 437½ grains, . . . . . . . | equal 1 ounce (symbol oz). |
| 7000 grains, or 16 ounces, . . . | equal 1 pound (symbol ℔ Av.). |

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* For fuller details our readers are referred to the excellent treatise on the Practice of Pharmacy by Professor Remington, of Philadelphia. J. B. Lippincott & Co., 1885.

The British Pharmacopœia is peculiar in using in its formulæ Avoirdupois weight; the United States Pharmacopœia adhering to Troy weight. Symbols are employed to designate the different denominations; thus, in Apothecaries' weight, gr. (Lat. *granum*) stands for grain or grains; ℈ (Lat. *scrupulum*) stands for scruple or scruples; ʒ (Lat. *drachma*) for drachm or drachms, and ℥ (Lat. *uncia*) for ounce or ounces. In prescriptions, as well as in dispensing, these symbols are commonly employed; they will be referred to again under the section on Prescription-Writing.

Fluids, as already stated, may be dispensed by weight; but they are usually measured and sold by quantity.

*Apothecaries' Measure.*

| | | |
|---|---|---|
| 60 minims (symbol ♏), . . . | equal 1 fluidrachm | (symbol f ʒ ). |
| 480 minims, or 8 fluidrachms, . . | equal 1 fluidounce | (symbol f ℥ ). |
| 7680 minims, or 16 fluidounces, . . | equal 1 pint | (symbol O). |
| 61440 minims, or 8 pints, . . . | equal 1 gallon | (sympol C). |

An Imperial pint contains twenty fluidounces, of which there are eight in the Imperial gallon. The latter will contain ten pounds of distilled water (at 60° F.) The Imperial fluidounce weighs 437.5 grains, which is less by 18.2 grains than the United States Pharmacopœia ounce of water. This should be remembered in copying prescriptions from English medical publications.

The metric system of weights and measures is growing in favor, and is employed by nearly all European pharmacopœias, and partly by that of the United States.* The unit of this system is the metre, which is the ten-millionth part of one-fourth of a meridian, or one forty-millionth of the polar circumference of the earth. This has been found to be a little more than the English yard (3 feet 3 inches and $\frac{3}{8}$), or 39.37 inches. From this unit of length the unit of capacity is derived; a thousandth part of a cubit metre is a litre, which contains a little more than two pints ($2\frac{1}{10}$ pints); it is represented by a cube whose height is one-tenth of a metre. The unit of weight is obtained by taking the weight of distilled water which will fill a cube whose sides measure one one-hundredth of a metre; this is called the gramme, and it is equivalent to 15.432 grains. By a system of prefixes the quantities are readily expressed by multiplication or division; thus, *myria* = 10,000 times, *kilo* = 1000 times, *hecto* = 100 times, *deka* = 10 times; whereas *deci* means $\frac{1}{10}$, *centi* $\frac{1}{100}$, and *milli* $\frac{1}{1000}$. This will be readily understood by referring to the following table, in which the relative value of different denominations in the metric and English systems are approximately given.

*Measures of Length.*

| | | | | | |
|---|---|---|---|---|---|
| $\frac{1}{1000}$ metre . . | = 1 millimetre | (mm.), | or | | $\frac{1}{25}$ inch. |
| $\frac{1}{100}$ metre . . | = 1 centimetre | (cm)., | " | | $\frac{4}{10}$ inch. |
| $\frac{1}{10}$ metre . . | = 1 decimetre | (dm.), | " | | $3\frac{15}{16}$ inches. |
| 1 metre . . | = 1 METRE | (M.), | " | | 39.37 inches. |
| 10 metres . . | = 1 Dekametre | (Dm.), | " | | 32.81 feet. |
| 100 metres . . | = 1 Hectometre | (Hm), | " | | 328.09 feet. |
| 1000 metres . . | = 1 Kilometre | (Km.), | " | | 3280.9 feet. |
| 10000 metres . . | = 1 Myriametre | (Mm.), | " | 32,809 feet, or | $6\frac{1}{4}$ miles. |

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* In the revision of 1890, the committee adopted the metric system throughout the U. S. Pharmacopœia.

### *Measures of Capacity.*

| | | | | |
|---|---|---|---|---|
| $\frac{1}{1000}$ litre . | = 1 | cubic centimetre (c.cm.), or millilitre | (ml.) = | 16.0 minims. |
| $\frac{1}{100}$ litre . | = 1 | centilitre | (cl.) = | 2.705 fʒ. |
| $\frac{1}{10}$ litre . | = 1 | decilitre | (dl.) = | 3.381 f℥. |
| 1 LITRE (L.) | = $2\frac{1}{10}$ | pints | (O) = | 33.815 f℥. |
| 10 litres . | = 1 | Dekalitre | (Dl.) = | 2.641 gall'ns. |
| 100 litres . | = 1 | Hectolitre | (Hl.) = | 26.419 gall'ns. |
| 1000 litres . | = 1 | Kilolitre | (Kl.) = | 264.19 gall'ns. |
| 10000 litres . | = 1 | Myrialitre | (Ml.) = | 2641.9 gall'ns. |

### *Measures of Weight.*

| | | | | |
|---|---|---|---|---|
| $\frac{1}{1000}$ gramme, | or 1 milligramme | (mg.) . . | equal to $\frac{1}{64}$ | grain. |
| $\frac{1}{100}$ gramme, | or 1 centigramme | (cg.) . . | equal to $\frac{1}{6}$ | grain. |
| $\frac{1}{10}$ gramme, | or 1 decigramme | (dg.) . . | equal to 1.5 | grains. |
| 1 gramme | | (G.) . . | equal to 15.432 | grains. |
| 10 grammes, | or 1 Dekagramme | (Dg.) . . | equal to 154.32 | grains. |
| 100 grammes, | or 1 Hectogramme | (Hg.) . . | equal to 3.52 | oz. Av. |
| 1000 grammes, | or 1 Kilogramme | (Kg.) . . | equal to 2.2 | lbs. Av. |

### *Relation of Metric Weights and Measures to Apothecaries' Weights and Measures.*

| | | | |
|---|---|---|---|
| 1 grain | equals | 0.0647895 | gramme. |
| 1 scruple | " | 1.295 | grammes. |
| 1 drachm | " | 3.887 | grammes. |
| 1 ounce | " | 31.103 | grammes. |
| 1 minim | " | 0.061613 | cubic centimetre or millilitre (weighing |
| | | .0616 | gramme, or 0.95 grain). |
| 1 drachm | " | 3.697 | millilitres, or cubic centimetres. |
| 1 ounce | " | 2.957 | centilitres. |
| 1 pint | " | 4.273 | decilitres. |
| 1 gallon | " | 3.785 | litres. |

In ordinary use, in prescription-writing, the following table will be found to be nearly correct, and can be easily memorized.

| | | |
|---|---|---|
| ♏j or gr.j . . . . . | equals | .06 gramme. |
| fʒj or ʒj . . . . . | " | 4.0 grammes. |
| f℥j or ℥j . . . . . | " | 32.0 grammes. |

The use of a decimal line greatly reduces the possibility of mistakes in reading such prescriptions. As .06 (drug) is less than 1 grain, while 4. and 32. (vehicle) are more than the fluidrachm or ounce, there is no danger of giving a stronger dose than was intended by using this system. C.cm. (cubic centimetres), used for G. (grammes), causes an error of about 5-per-cent. excess.

A teaspoonful is usually 5 gm. or c.cm.; a tablespoonful, 20 gm. or c.cm. Since domestic measurements of this kind are so irregular and unreliable, it is best to have the patient take his medicine from a properly graduated glass or a standard spoon.

Ordinary expressions of weight or measure, therefore, may be reduced to metric terms by the following rule: Multiply grains by 6, and the result will be centigrammes; multiply drachms by 4, or ounces by 32, and the result will be grammes. In the same manner, by dividing centigrammes by 6, we obtain grains; or grammes by 4 or 32, and the result will be the number of drachms or ounces, as the case may be.

Liquids are usually measured, when compounding prescriptions, in convenient glass vessels, which, on account of having their capacity graduated by marks blown or engraved upon them, are known as graduates. They are usually smaller at the bottom, having a conical shape, or they may be cylindrical. The indications of capacity may be according to the ordinary apothecaries' liquid measure or to the metric system. Larger quantities are measured in tinned-iron or copper measures, where the liquid is not corrosive; for liquids which cannot be measured in metallic vessels glass or porcelain can be used. Small quantities are measured by minims or by drops. The only accurate method of regulating the dosage of small quantities is by using a small instrument known as a minim-pipette. This is simply a glass tube, with a slightly contracted extremity, so that it will deliver its contents not too rapidly. Upon the side the tube has graduations engraved upon it. A rubber cap may be applied to the upper extremity, by which fluid may be drawn into the tube when its point is placed under the surface. The desired amount may then be expelled by compressing the cap or bulb, and the amount is indicated by the graduations. If the pipette is long enough the rubber bulb can be dispensed with and the mouth applied to produce suction, the liquid afterward being retained by placing the forefinger over its upper end, by which also the flow may be regulated. A little experience with this instrument will enable the operator to transfer small quantities of liquid from one receptacle to another with considerable accuracy and rapidity. A good way to keep the pipette ready for use and clean is to use a perforated cork, passing the pipette through it into a bottle containing alcohol or water. When water or any fluid capable of wetting the glass is used the fluid will creep up the sides of the tube by capillary attraction, and the outer edge of the fluid will therefore be higher than the remainder of the surface. In reading the measure it is customary to take the level of the centre of the liquid, or a plane slightly above it, in order to be accurate.

In spite of the fact that every one knows that a drop is not a unit of measure, and that the size and weight of drops of liquid vary according to temperature, specific gravity, and even the shape of the bottle from which they come, and that the drops of some liquids are much larger than others,—for instance, the drop of deodorized tincture of opium being nearly twice as large as that of the ordinary tincture,—physicians constantly prescribe active medicines by drops when they mean minims, if they mean anything at all definite. This uncertainty with regard to drops is shown by the following table,* where every attempt to maintain uniformity was observed:—

| | | | |
|---|---|---|---|
| Acetum opii, | 90 | drops in | 60 minims. |
| Acetum scillæ, | 68 | “ | “ |
| Acidum aceticum, | 108 | “ | “ |
| Acidum carbolicum, | 111 | “ | “ |
| Acidum hydrocyanicum, | 60 | “ | “ |
| Acidum lacticum, | 111 | “ | “ |
| Acidum phosphoricum dil., | 59 | “ | “ |
| Acidum sulphuricum aromat., | 146 | “ | “ |

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* From a table prepared by the late Mr. Stephen L. Talbot. The preparations referred to are of the revision of 1870.

| | | | |
|---|---|---|---|
| Acidum sulphuricum dilut., | 60 | drops in | 60 minims. |
| Æther fortior, | 176 | " | " |
| Alcohol, | 146 | " | " |
| Aqua destillata, | 60 | " | " |
| Bromum, | 250 | " | " |
| Chloroformum purif., | 250 | " | " |
| Creasotum, | 122 | " | " |
| Ext. belladonnæ fld., | 156 | " | " |
| Ext. colchici rad. fld., | 160 | " | " |
| Glycerinum, | 67 | " | " |
| Liquor acidi arseniosi, | 57 | " | " |
| Liquor arseni et hydrarg. iodidi, | 58 | " | " |
| Liquor hydrargyri nitratis, | 131 | " | " |
| Liquor iodi comp., | 63 | " | " |
| Liquor potassæ, | 62 | " | " |
| Liquor potassii arsenitis, | 57 | " | " |
| Oleoresina aspidii, | 130 | " | " |
| Oleum caryophylli, | 130 | " | " |
| Oleum ricini, | 77 | " | " |
| Oleum tiglii, | 104 | " | " |
| Spiritus chloroformi, | 150 | " | " |
| Syrupus, | 65 | " | " |
| Syrupus scillæ, | 75 | " | " |
| Syrupus scillæ comp., | 102 | " | " |
| Syrupus senegæ, | 106 | " | " |
| Tinctura aconiti, | 146 | " | " |
| Tinctura belladonnæ, | 137 | " | " |
| Tinctura digitalis, | 128 | " | " |
| Tinctura ferri chloridi, | 150 | " | " |
| Tinctura iodi, | 148 | " | " |
| Tinctura nucis vomicæ, | 140 | " | " |
| Tinctura opii, | 130 | " | " |
| Tinctura opii camph., | 130 | " | " |
| Tinctura opii deodorat., | 110 | " | " |
| Tinctura veratri viridis, | 145 | " | " |
| Vini colchici radicis, | 107 | " | " |
| Vini colchici seminis, | 111 | " | " |
| Vini opii, | 100 | " | " |

Scientific accuracy in prescribing and in dispensing medicines can only be obtained by carefully measuring or weighing the agent in graduates or scales of standard accuracy. Where a fraction of a grain, drop, or minim of some powerful remedy is ordered the division can be made more evenly by diffusing the remedy in a larger quantity or some menstruum in which it is soluble, like alcohol, ether, water, or some inert powder, like gum arabic. Thus, the one one-hundred-and-twentieth of a grain of atropine may be obtained by dissolving one grain in an ounce of water, of which four minims would represent the desired quantity. Croton-oil and similar agents can be dissolved in alcohol or diffused through some inert powder, like milk-sugar, and thus be accurately divided into parts smaller than the minim or drop.

Most pharmacists are supplied with a full set of metric weights and measures, and can compound prescriptions in accordance therewith ; but there are practical objections and difficulties that stand in the way of the general adoption of the French system which will prevent its general use in prescription-writing for many years, or until they are overcome, as pointed out by Professor Oscar Oldberg. At the same time those physicians who have been trained according to the metric system may find it easier for themselves to continue to employ it in prescription-writing; they owe it to their patients, however, to see that the prescriptions are sent to a pharmacist sufficiently versed in the system not only to avoid making mistakes himself, but also to qualify him to detect any errors that may have been accidentally made by the physician. The maximum dosage of drugs, according to the usual metrology, is usually known to a drug-clerk, but he is not often found familiar with the doses according to the metric system, and therefore the chances of mistakes in compounding are greatly increased. Bottles are now provided by the manufacturers, which contain definite quantities, according to decimal system, in cubic centimetres or millilitres; and pipettes and graduates, marked in metric equivalents, are for sale in all establishments for the sale of scientific apparatus. Until measures are taken for the general adoption of the new system, both by physician and pharmacist, prescriptions should be written and compounded according to the weights and measures in general use in other departments of applied science and social life.

**Determination of Temperature and Specific Gravity.**—In some pharmaceutical operations it is necessary to take into consideration the temperature or relative degree of heat, both of the room in which the work is going on and of the object manipulated. For instance, the laboratory or room may be below zero or above 90 degrees; it usually is about 65 degrees, or between this and 70 degrees, and, where no temperature is specified, it is supposed to be at this point. When it differs much, either above or below, it should be noted, especially when taking the specific gravity of fluids.

The instruments employed in measuring degrees of heat are called thermometers; they do not indicate absolute heat, but only its relative intensity. Thus, more heat would be required to raise a gallon than an ounce of water 1 degree, and yet the thermometer would register the same in each case. The quantity of heat is calculated in another way,—according to the laws of physics. Thermometers used to indicate the degree of heat are usually made of glass, pure mercury being preferred as the index because it expands uniformly between the boiling-point of water and its freezing-point. On account of the contraction of the glass, old thermometers generally read too high. Where the temperature is important, the thermometer may be compared with a standard, and its variations noted and allowed for. Thermometers should be three years old before being used, in order to allow for the shrinkage of the glass, which usually reaches its limit in this time.

Thermometers in this country are usually marked according to Fahrenheit's scale, which commences at 32 degrees below the melting-point of ice and divides the intervening space between this and the boiling-point of water into 212 equal gradations, making 180 degrees between the point at which ice melts and water boils; the degrees above and below these extremes are established by experiment. This form of thermometer is generally employed in this country for laboratory work, and is given the second place by the U. S. Pharmacopœia. In Reaumur's thermometer, which is in use to some extent on the continent of Europe, the freezing-point is 0 degrees and the boiling-point 80 degrees. The Centigrade, or the thermometer of Celsius, is principally used for scientific work all over the world, and has the first place in the U. S. Pharmacopœia (1880). The melting-point of ice is zero and the boiling-point of water is 100 degrees, the intervening space being equally divided into degrees Centigrade. The reading in Fahrenheit degrees may be converted into Centigrade by a simple rule. Bearing in mind that the former begins 32 degrees below freezing, which is the zero of the other, and that the space in the former occupying 180 degrees only covers 100 degrees of the latter, we have the following:—

**To convert Fahrenheit degrees into Centigrade,** subtract 32, multiply by 100, and divide by 180,—the result will be degrees Centigrade.

**To convert Centigrade degrees into those of Fahrenheit,** multiply by 180, divide by 100, and add 32.

As both scales are in use in clinical medicine, it is necessary for the student to familiarize himself with this calculation and remember the rules.

All thermometers are not equally sensitive, while some reach their maximum reading in one minute, others require three or four to get up to the proper degree. In pharmacy, this is of less consequence than in practice of medicine in taking the temperature of the body, where the rule is to permit the thermometer to remain in place at least five minutes before reading off the temperature.

The specific gravity of any substance is an expression of the relative weight of any quantity of the substance as compared with an equal bulk of distilled water at a temperature of 60 degrees and under ordinary conditions of atmospheric pressure as indicated by the barometer. It may be ascertained directly in the case of a liquid by placing it in a bottle which, when filled to the same point with distilled water, would contain just 1000 grains of the latter, and weighing it accurately; in this way, by subtracting the weight of the bottle, we get the weight of a quantity of liquid which exactly fills the space that 1000 grains of water would. The result is the specific gravity of the liquid. An easier, though less direct, method is to use specific-gravity beads, which are small, balloon-shaped, glass globes, of different sizes and weights, so adjusted that they have different degrees of buoyancy. Figures are scratched upon each one, showing the specific gravity of the medium in which it swims indifferently, neither floating nor sinking. These are known as Levi's beads, and are used in cases where a liquid is to be evaporated until it attains a given specific gravity. They are hydrometers having only one specific gravity. An improvement on this, which is in general use, is the mercurial hydrometer, of which two are used,—one for liquids heavier than water and one for liquids lighter that water. The form in general use is that of Baumé, which consists of a closed glass tube, loaded at the lower end with mercury or shot, and having an expansion, just above the weight, containing air, which causes it to float in an upright position. The original scale of Baumé has been superseded by the specific-gravity scale, which is engraved upon the stem of the instrument. Hydrometers are usually floated in cylindrical glass jars, the instrument sinking to a certain depth in liquids to be tested; the degree marked upon the scale cut by the surface of the fluid indicates the specific gravity at the ordinary temperature (60 degrees). Alcoholmeters, elæometers, and lactometers are used for alcohol, oils, and milk, respectively. The urinometer, used in testing urine, is a specific-gravity hydrometer. The best form for this purpose is that manufactured by Dr. E. R. Squibb, of New York, which is remarkably accurate.

**Heat** is indispensable in pharmaceutical operations. Any of the ordinary sources of heat may be utilized, but it is found more convenient to use alcohol or illuminating-gas for the majority of the purposes to which heat is essential. The ingenuity of inventors has supplied us with small lamps or stoves, burning alcohol or petroleum, which are most convenient and cleanly. A Bunsen gas-burner, or one of its many modifications, is now an indispensable adjunct to the pharmaceutical laboratory.

The following are the principal procedures requiring heat:—

1. **High Temperatures.**—Ignition, or burning. Fusion, or melting. Calcination, or driving off volatile substances by heat. Deflagration, or burning with the aid of oxygen or some substance, like nitre or potassium chlorate, capable of yielding oxygen. Carbonization, or heating organic substances without exposure to air; the volatile substances escape, and the residue is of a dark color, like charcoal. Torrefaction, or roasting. Incineration, or reduction to cinders by consuming all the carbon. Sublimation, or separation of a volatile solid substance from another not volatile by heat.

2. **Temperatures Less High.**—Among these are the water bath; steam bath; glycerin, oil, or sand bath. In the water bath it is not possible to raise the temperature higher than 212° F., but the addition of salt increases the density and raises the boiling-point to 227.1. By using steam under pressure the temperature may be still further increased 100 degrees. Vaporization and evaporation are employed to separate volatile substances from fixed bodies. "When vaporization is used to separate a volatile liquid from a less volatile liquid it is called **evaporation**. When the object sought is the volatile liquid it is called **distillation**. When it is used to separate a volatile liquid from a solid it is called **desiccation, exsiccation,** or **granulation.** When it is used to separate a volatile solid from another body it is called **sublimation.**"

Many of the most useful classes of preparations are made with the aid of heat of moderate degree of intensity. Infusions are liquid preparations made by treating vegetable substances with either hot or cold water, but usually the former. The preparation must not be boiled. Cold water is selected as a menstruum when the drug contains some volatile substance which may be dissipated by heat, such as the prunus Virginiana. The general directions given by the pharmacopœia are to take 10 parts of the substance and boiling water q. s. to make 100 parts. "Put the substance into a suitable vessel provided with a cover, pour upon it the boiling water, cover the vessel tightly, and let it stand for half an hour. Then strain, and pass enough water through the strainer to make the infusion weigh 100 parts." The strength of energetic or powerful substances should be specially prescribed by the physician. In the four official solutions the decimal system is not followed. The infusion of cinchona is 6 per cent., digitalis 1½, wild cherry is 4, and the compound infusion of sennæ contains 6 per cent. of senna and 12 each of manna and sulphate of magnesium.

Decoctions require not only boiling water, but boiling vegetable substances with water. The general official formula for an ordinary decoction, the strength of which is not directed by the physician nor specified by the pharmacopœia, is prepared in the same decimal proportion of ingredients as the infusion, but the process differs. Put the substance into a suitable vessel provided with a cover, pour upon it 100 parts of cold water, cover it well, and boil for fifteen minutes; then let it cool to about 40° C. (104° F.), express, strain the expressed liquid, and pass enough cold water through the strainer to make the product weigh 100 parts. Of the two official decoctions, that of cetraria contains only 5 per cent.; that of sarsaparilla comp. contains 10 of sarsaparilla, with 2 each of sassafras, guaiac, and licorice-root, with 1 of mezereon.

In making extracts, the heat of the water bath is utilized in evaporating the extract to a pilular consistency. Heat is also employed in making ointments, cerates, suppositories, solutions, in spreading plasters, and a variety of other pharmaceutical manipulations.

Other operations are chiefly mechanical,—among these are comminution, solution, separation of fluids and solids, filtration, clarification, decoloration, precipitation, crystallization, granulation, dialysis, extraction, expression, percolation, maceration, separation of immiscible fluids, decantation and siphonage.

**Comminution** is the process of breaking a solid into small pieces. In the case of herbs, the agent may be broken up by cutting, slicing or chopping, or, if it be sufficiently dry, it may be ground in a mill or mortar, or it may be rasped or grated. When it is reduced to fragments by being subjected to a sucession of blows, the process is called **contusion.** Drugs are frequently cut or sliced and then contused, preparatory to making pharmacopœial preparations, such as infusions, decoctions, or tinctures. For small quantities the mortar and pestle are generally used, but larger quantities are ground in a drug-mill. Different degrees of fineness of powder may be attained, being regulated by the fineness of the meshes of sieves through which it is to be passed to separate it from the coarser particles and make it uniform. When reduced to a very minute subdivision it is said to be impalpable, because the substance has lost its character of hardness, and is soft and light to the touch. **Very fine** powder passes through a sieve having eighty or more meshes to the linear inch, and is known as No. 80 powder; **fine** powder passes through a sieve of sixty meshes to the inch and is called No. 60; **moderately fine** powder passes through one having fifty meshes to the inch, No. 50 powder; **moderately coarse** powder passes through a sieve of forty meshes to the inch, No. 40 powder; and **coarse** powder is only required to pass through a sieve having twenty meshes to the linear inch, No. 20 powder. These are the five different degrees of fineness and names to distinguish them, adopted by the United States Pharmacopœia. For very fine powders bolting cloth is used, which gives a product as smooth as flour. Levigation is the term applied to a process for reducing solids to a powdered state by adding some liquid in which they are not soluble, the paste thus formed being rubbed up in a shallow mortar or on a glass slab with another piece of glass somewhat bell-shaped, with a solid, flat base, which is known as a muller. When a porphyry slab and muller are used the process is termed porphyrization. Another method is to use an excess of liquid, in which the fine insoluble powder is suspended, and then decanting the portion of the liquid containing the lighter particles, which is set aside, the fine powder subsequently subsides to the bottom of the receiver, and the supernatant liquid may then be poured off and the powder dried. This is known as **elutriation**; a good illustration is the preparation known as prepared chalk, which is made in this way. By a modification of the latter process the semi-liquid, pasty mass, containing the elutriated powder, may be placed in a funnel-shaped receptacle fastened in a wooden frame, having a short leg near its middle, and a handle.

The material having been placed in the receptacle, the apparatus is held in the hand, and the leg tapped slightly upon a table of chalk or other porous substances; the shock of impact causes a small portion to become detached from the rest and to fall in the form of small, conical masses or troches, which, with a little practice, may be made nearly uniform in size. Pastils (**Pastilla**) are small masses of this kind, which are usually made with aromatic substances and used for fumigation; but in reality " pastille" is only the French name for troche or lozenge, and therefore includes the former. Some substances are refractory to pulverization, and it is necessary to resort to some expedient to overcome this. Thus, gold-leaf may be pulverized by rubbing it into a paste with honey or potassium sulphate, afterward removing the foreign element by washing with water. Camphor is pulverized by the addition of a few drops of alcohol or chloroform, although it may be obtained from the spirits by the addition of water, and elutriation or filtration, and afterward removing the alcohol or water by evaporation. Metallic tin is granulated by agitating melted (fused) tin with chalk-powder, the latter being subsequently removed by elutriation or by chemical solution with an acid. Phosphorus may be pulverized by heating it in the presence of water until melted and keeping it agitated until cooled. Calomel, calcined magnesia, and sulphur may by sublimed, and, by introducing steam, an exceptionally fine product is obtained. A coarse powder is produced by evaporating a solution to point of concentration and continuing the evaporation, while stirring the liquid, until all the fluid is evaporated. This process is known as **granulation**. Granular effervescent salts are made by thoroughly mixing the perfectly dry material and moistening the mixture with strong alcohol. The pasty mass is pressed through a sieve, and the granules quickly dried in a hot chamber and packed in hermetically sealed bottles to exclude the moisture of the air. Pulverization is sometimes preceded by **exsiccation**, by which water of crystallization is driven off; this is usually required for salts like alum and sulphate of iron, which contain a large proportion of water of crystallization. Some metals, like zinc, are granulated by melting them and pouring them in a fine stream into water. Pepsin and similar adhesive substances are reduced to a powdered state by being dissolved and painted on glass plates, from which, after drying, it is scraped off in fine scales. If a finer powder is needed, a cold mortar, perfectly dry and washed with alcohol, is used. The operation is facilitated by combining some rather hard solid with the powder,—like milk-sugar.

**Solution** is the process whereby a solid or gaseous substance is made to lose its physical identity by the power of some liquid known as a solvent or menstruum. When the liquid has dissolved some, and will take up no more of the substance, it is called a saturated solution. A simple solution is one which contains the original substance chemically unaltered and will yield it again by evaporation. A chemical solution is one in which some chemical action takes place, and the evaporation of the liquid will yield a body having different chemical properties from the original substance. Solution is favored by agitation and usually by the application of heat. Rapid solution is accompanied by change of temperature and abstraction of heat from surrounding bodies, so that the process may be used as a cooling agency. Freezing mixtures are made in this way. On the contrary, where chemical change occurs, there is apt to be a rise of temperature.

A **decimal solution** contains one part of the substance in ten of the menstruum; a 1-per-cent. solution is a **centesimal solution.** The principal solvents employed in pharmacy are the following:—

**Water** (preferably chemically pure, or recently distilled water, as ordinary spring or river water contains more or less earthy and organic matter, in solution or suspension) is used in making liquors, medicated waters, infusions, decoctions, solutions, syrups, etc. **Alcohol** is used very largely, and is next in importance to water. As it has antiseptic qualities, solutions with alcohol are not liable to fermentation, as watery preparations are. Moreover, alcohol is a solvent for many substances that are insoluble in the former menstruum, such as resins, volatile or fixed oils, alkaloids, glucosides, etc., while gum, albumen, and starch are not affected by it. This affords an opportunity of dissolving out the medicinal qualities or principles, and leaving the inert, woody and starchy matters. In some of the manipulations, dilute alcohol is directed which contains one-half water, or, more correctly, according to the pharmacopœia, it contains about "41 per cent. by weight, or about 48.6 per cent. by volume of absolute ethyl alcohol, and about 59 per cent. by weight of water." Alcohol is the basis of the spirits, elixirs, tinctures, medicated wines, and many of the fluid extracts of the pharmacopœia. Ether, benzol, chloroform, carbon bisulphide, acids, and oils are all recognized as solvents in appropriate cases.

Solids may be separated from liquids, or solutions containing them, by filtration, precipitation, decantation, siphonage, evaporation, and crystallization. **Dialysis** is a process by which a crystallizable substance in solution may be separated from non-crystallizable (colloid) substances. Graham, in 1861, brought out this very useful process, which depends upon the diffusibility of certain solutions through porous partitions. The usual form is a circular frame, like a sieve, in which the wire meshes are replaced by a diaphragm of parchment or parchment-paper (made by immersing unsized white paper in a cold mixture of two measures of sulphuric acid and one of water). The dialyzer is floated upon the surface of water in a proper receptacle, and the mixture to be separated is placed within it. A bladder suspended in a glass jar would answer the same purpose. This process is useful to separate alkaloids from organic mixtures, especially for purposes of quantitative testing. It is particularly applicable to toxicological investigations,—in separating poisons, such as arsenic, from the fluid material found in the stomach.

When the object in view is to separate active principles from the other constituents of drugs, a liquid is employed, termed a menstruum, in which the desired principles are soluble. The principal modes of **extraction** employed by pharmacy, at present, are maceration and expression, percolation, digestion, infusion, decoction. Maceration requires the drug to be in a coarse powder, contused or properly comminuted. The usual method is to place the powder and menstruum in a large bottle, until the soluble constituents are all taken up,—a process which may be facilitated by occasional shaking during a week or more. This was formerly the process employed in making tinctures, and still is followed by the German Pharmacopœia. In this country it is now superseded by the process of percolation, which is much more expeditious, and, when properly done, equally effective. **Percolation,** or displacement, is the process by which a powder packed in a conical or cylindrical receiver known as a percolater is exhausted of its active principles or medicinal qualities by the descent through it of a suitable solvent. **Lixiviation** is the name applied to this process when the substance is first incinerated, as in the process of extracting lye from wood-ashes. The U. S. Pharmacopœia gives specific directions for this process, which is largely used in making tinctures and fluid extracts, as follows : " The process of percolation, or displacement, directed in this pharmacopœia, consists in subjecting a substance, or a mixture of substances, in powder, contained in a vessel called a percolator, to the solvent action of successive portions of a certain menstruum in such a manner that the liquid, as it traverses the powder in its descent to the receiver, shall be charged with the soluble portion of it, and pass from the percolator free from insoluble matter.

" When the process is successfully conducted the first portion of the liquid, or percolate, passing through the percolator, will be nearly saturated with the soluble constituents of the substance treated ; and if the quantity of menstruum be sufficient for its exhaustion, the last portion of the percolate will be destitute of color, odor, and taste, other than those of the menstruum itself.

" The percolator most suitable for the quantities contemplated by this pharmacopœia should be nearly cylindrical, or slightly conical, with a funnel-shaped termination at the smaller end. The neck of this funnel-end should be rather short, and should gradually and regularly become narrower towards the orifice, so that a perforated cork, bearing a short glass tube, may be tightly wedged into it from within until the end of the cork is flush with the outer edge of the orifice. The glass tube, which must not project above the inner surface of the cork, should extend from 3 to 4 cm. beyond the outer surface of the cork, and should be provided with a closely-fitting rubber tube, at least one-fourth longer than the percolator itself, and ending in another short glass tube, whereby the rubber tube may be so suspended that its orifice shall be above the surface of the menstruum in the percolator, a rubber band holding it in position.

"The size of the percolator selected should be in proportion to the quantity of drug extracted. When properly packed in the percolator, the drug should not occupy more than two-thirds of its height.

"The percolator is prepared for percolation by gently pressing a small tuft of cotton into the neck above the cork, a thin layer of clean and dry sand being then poured upon the surface of the cotton to hold it in place.

"The powdered substance to be percolated (which must be uniformly of the fineness directed in the formula, and should be perfectly air-dry before being weighed) is put into a basin, the specified quantity of menstruum is poured on, and it is thoroughly stirred with a spatula, or other suitable instrument, until it appears uniformly moistened. The moist powder is then passed through a coarse sieve—No. 40 powders, and those which are finer, requiring a No. 20 sieve, whilst No. 30 powders require a No. 15 sieve for this purpose. Powders of a less degree of fineness usually do not require this additional treatment after the moistening. The moist powder is now transferred to a sheet of thick paper and the whole quantity poured from this into the percolator. It is then shaken down lightly and allowed to remain in that condition for a period varying from fifteen minutes to several hours, unless otherwise directed; after which the powder is pressed, by the aid of a plunger of suitable dimensions, more or less firmly, in proportion to the character of the powdered substance and the alcoholic strength of the menstruum; strongly alcoholic menstrua, as a rule, permitting finer packing of the powder than the weaker. The percolator is now placed in position for percolation, and, the rubber tube having been fastened at a suitable height, the surface of the powder is covered by an accurately-fitting disk of filtering-paper, or other suitable material, and a sufficient quantity of the menstruum poured on through a funnel reaching nearly to the surface of the paper. If these conditions are accurately observed, the menstruum will penetrate the powder equally until it has passed into the rubber tube and has reached, in this, a height corresponding to its level in the percolator, which is now closely covered to prevent evaporation. The apparatus is then allowed to stand at rest for the time specified in the formula.

"To begin percolation, the rubber tube is lowered and its glass end introduced into the neck of a bottle previously marked for the quantity of liquid to be percolated, if the percolate is to be measured, or of a tared bottle if the percolate is to be weighed; and, by raising or lowering this receiver, the rapidity of percolation may be increased or decreased as may be desirable, care being taken, however, that the rate of percolation, unless the quantity of material be largely in excess of the pharmacopœial quantities, shall not exceed the limit of 10 to 30 drops in a minute. A layer of menstruum must constantly be maintained above the powder, so as to prevent the access of air to its interstices, until all has been added, or the requisite quantity of percolate has been obtained. This is conveniently accomplished, if the space above the powder will admit of it, by inverting a bottle containing the entire quantity of menstruum over the percolator in such a manner that its mouth may dip beneath the surface of the liquid, the bottle being of such shape that its shoulder will serve as a cover for the percolator.

"When the dregs of a tincture, or of a similar preparation, are to be subjected to percolation, after maceration with all or with the greater portion of the menstruum, the liquid should be drained off as completely as possible, the solid portion packed in a percolator, as before described, and the liquid poured on, until all has passed from the surface, when immediately a sufficient quantity of the original menstruum should be poured on to displace the absorbed liquid, until the required quanity has been obtained.

"Authority is given to employ, in the case of fluid extracts, where it may be applicable, the process of repercolation without change of the initial menstruum." *

Fractional percolation is the same process applied to two successive portions of the powder, the result being identical with repercolation.

**Pharmaceutical testing and analysis** is the method followed in ascertaining the presence of certain constituents and determining the proportion if present. The methods followed are not different from those employed in organic chemistry and in the laboratory. The pharmacopœia supplies a list of standard reagents for the purpose of applying the tests prescribed in the text. As the processes of analysis are not peculiar to pharmacy, the space will not be taken here to consider them in detail. In practical pharmacy the microscope is indispensable for the recognition of drugs and adulterants and for the examination of crystalline deposits and sediments.

**Expression** is the process of forcibly separating liquids from solids. It is a very ancient method, the best-known form being the wine- or fruit-press. After macerating a crude drug for the desired length of time, the full amount of tincture is obtained by decantation and expression.

**Precipitation** is the process of separating solid particles from a solution by the action of physical or chemical means. If the precipitate is of lower specific gravity than the liquid it will float upon its surface; if, as usually is the case, it is of higher specific gravity it will sink to the bottom of the receptacle. Precipitates may be curdy, granular, flocculent, gelatinous, crystalline, amorphous, etc. A magma is a thick, more or less tenacious, precipitate. Substances containing albumen are precipitated by heat; light precipitates silver salts; but the most frequent method of precipitation is by chemical action. This is resorted to (1) for the purpose of obtaining substances in the form of a powder, (2) as a means of purification, (3) for testing chemicals, and (4) to isolate chemicals. In assuming the crystalline form, some salts take up considerable water, which is known as water of crystallization; the amount varies in different salts, but it is important to bear this in mind with some salts like sulphate of iron or alum, as the water should be expelled by heat before making them into pills or powders. Such salts are liable to deliquesce and become moist or liquid by absorbing more moisture from the air, or in a dry atmosphere they may effloresce from loss by water.

The preparation of extemporaneous formulæ is not different in principle from the official, except that some extemporaneous preparations may be ordered which have no relation to the pharmacopœia. For instance, some preparations of the English, German, or other pharmacopœias are occasionally prescribed, or formulæ which are original with the physician. Unofficial articles, or new remedies, are also often included in the magistral prescription, but care should be taken that this is not done to excess. It is by no means creditable to a physician to be constantly trying much-vaunted new remedies or proprietary preparations, and neglecting to use the older remedies of established reputation and of standard composition, which have received the sanction of the pharmacopœia. The art of prescribing will now be taken up for consideration.

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* Pharmacopœia of the United States of America, 7th Decennial Revision, p. xl *et seq.*

## PRESCRIPTION-WRITING AND FORMULÆ.

In the progress of the science of medicine, it has been found necessary, owing to the accumulation of knowledge, to institute special departments of study, as well as specialties in practice. It having become inexpedient for a physician to collect his own herbs in the fields, to make his own preparations, and to dispense his own prescriptions, these duties have been delegated and entrusted to the trained pharmacist and his assistants, who have special qualifications for the task, to which they devote their whole time and attention. This division of labor is to the advantage of scientific medicine, as the practitioner of medicine is relieved of routine work and has more leisure to devote to the study of pathology, diagnosis, and therapeutics.

**The Prescription.**—The physician usually writes his directions regarding the medicines which the patient is to take according to a general form the writing being called "the prescription" (*præscribo, præscriptum, præscriptio*, in Latin,—something written for, or ordered; in French, *ordonnance*). As a prescription furnishes very tangible evidence of the attainments of a physician, and, being preserved on the prescription-file of the pharmacist as a matter of record, may confront him in the courts of justice, it is of considerable importance that students should be well drilled in prescription-writing before graduating, so that they may be spared mortification and possibly the loss of reputation, caused by blunders or carelessly-written formulæ, to say nothing of the risk to the patient.

The first point to be settled, in composing a prescription, is to determine the therapeutic indication and to decide upon the drug to be employed, and in what form it shall be given,—whether solid or liquid, and whether alone or combined with other remedies. Following this is the question of dosage and the number of doses and the length of time during which the remedy is to be given, which determines the quantity to be ordered in the prescription. The body of the prescription, or the formula, may have the quantities written according to the metric system, but, as pharmacists and physicians are more familiar with apothecaries' weights and measures, it is better, for ordinary purposes, at least, to follow the prevailing method, as a matter of precaution, and to prevent mistakes. It has been found that, by adopting a certain form in writing prescriptions, the work of compounding and dispensing is made easier and more certain, and the task of translation facilitated. In framing a prescription, certain principles should be kept in mind, in order that the product shall be creditable and accomplish the purpose for which it was written. The tendency of the day is toward simplicity, the elegant pharmaceutical preparations at our command having removed the necessity of the resort to **polypharmacy**, as it is called, when a large number of agents are combined in one prescription. As remedies are modified in their action by association with others, it is often advantageous to make such a combination, and knowledge and experience are sometimes displayed to marked advantage in originating such complex formulæ. Instances of this will be abundantly given in the section devoted to the consideration of drugs. It used to be the rule that a prescription should contain four parts,—(1) the base, (2) the adjuvant, (3) the corrigent, and (4) the vehicle; the dose of the first having been decided upon, the quantities of the other ingredients were made to correspond with it, so as to make the desired quantity of the medicine to be taken at a dose.

The first rule in prescribing should be to make a judicious selection of the active remedy or remedies to constitute the basis of the prescription, always taking a single remedy, unless a distinct advantage can be gained by using others in conjunction with it. In this connection, it should be noted that some drugs can be given in larger doses when thus combined, whereas others must have their doses reduced. As a general rule, where agents are from the same therapeutical class they mutually enhance each other's effects, and must be given in smaller doses than when given alone; when they belong to different classes, and especially when they act upon different organs, the dose can often be largely increased with advantage. Having settled upon the main remedy and its associate, and the quantity desired to be given, the question of eligibility comes up, in deciding upon the special pharmaceutical form to be employed. There are frequently representatives of the drug in question in several pharmacopœial classes,—some in solid form, others liquid,—each having, or supposed to have, some special application or advantage in certain cases, and offering favorable opportunities for combination. It may be a matter of indifference which form or preparation of the remedy is chosen, but the probabilities are that it is not, and that some are better suited than others. Thus, some of the preparations of iron are astringent, others acid; others contain alcohol, or are combined with tonics and alteratives; one combination is especially diuretic, another is used as styptic, and rarely given internally; one is used only as an antidote for arsenical poisoning, and so on.

Having decided upon the principal therapeutic agent, if we conclude to give it alone, that will complete the prescription formula, and we have only to add the directions to the pharmacist and to the patient (the latter directions being simply what is desired to be copied upon the label of the medicine-bottle or package). If we wish to combine our remedies, the following objects may govern our selection: First, an addition may be made of some agent which will assist the action of the main ingredient, or two or more may be selected which mutually aid each other. This aid may be chemical in character, as where dilute sulphuric acid is added to quinine sulphate to help in its solution, or hydrochloric acid is added to a digestive mixture containing pepsin; or it may be physiological, and intended to act upon some associated organ, so as to make the effect of the remedy more favorable; or, thirdly, to remedy some incidental disagreeable result. An example of the former is where resin-bearing purgatives, or cholagogue agents, and a sedative like belladonna or hyoscyamus are introduced into a purgative pill; an example of the latter is where hydrobromic acid is added to a cinchona preparation to prevent noises in the ears, or where carminatives are combined with a cathartic remedy, or the unpleasant effects of morphine are prevented by combining with it a small proportion of atropine. The object, not infrequently, may be purely pharmaceutical, as where a dry powder, as an excipient, is added in making pills. The third object of administering remedies in combination is to obtain a pleasant or at least as unobjectionable a form as possible.

When a remedy is exhibited in a form that the patient is utterly unable to swallow it, or is so repulsive that each dose causes nausea or vomiting, no matter how correct the prescription may be from the therapeutic standpoint, the patient will pronounce it a failure, and will probably relieve his feelings by uttering maledictions upon the doctor. On the other hand, if the remedy be attractive in appearance and pleasant to the taste, it will be regarded as a signal success, even though of less therapeutic activity. An agent is sometimes given merely for the mental and moral effect, without having any medicinal action directly. Such a combination is called a **placebo**, because it is administered simply to please the patient. Although placebos are rarely resorted to, patients should always be well treated, and with a little care much can be done toward making preparations pleasant. In choosing a physician, the voice of the patient would, in the majority of cases, be given, without hesitation, in favor of the prescriber who orders pleasant medicine, over him who has a special reputation for giving intolerably nasty ones. The young physician can get a hint from this which may greatly contribute to his success in after-life. Here a practical acquaintance with the expedients which modern elegant pharmacy offers, for overcoming the objectionable characters of remedies, is of the highest service, and has no mean intrinsic value from a financial point of view. A few suggestions may be given here. Solid medicines may be given in compressed pills, coated with chocolate, in pills sugar- or gelatin- coated, in capsules, or in suppositories. Powders can be given in *cachêts de pain*, gelatin capsules, or suspended in a dense syrup or other vehicle (such as stewed fruit or currant-jelly). Soluble or fluid agents, if unpleasant, are more difficult to hide, but they may be given in combination with aromatic or orange elixir, fruit-syrup, or in some aromatic water. Many illustrations will appear, and formulæ will be given of good forms of combination in the discussion of individual drugs under each head. A proper understanding and appreciation of this principle of combination will not only make the remedies more effective, but the patient will be less likely to forget to take his medicine, and will thus co-operate with the physician rather than oppose him in every possible way. This is seen to the best advantage in the management of sick children, where the remedies must be palatable or the struggles of the child to escape a nauseous dose may do it more harm than the medicine will do good.

In combining remedies the question of incompatibility demands consideration. Remedies may be (1) pharmaceutically incompatible, (2) chemically incompatible, or (3) physiologically incompatible. Agents are pharmaceutically incompatible when the proposed combination is either impracticable or extremely undesirable. Thus, the addition of water to a tincture of a resin-bearing drug precipitates the resin or oleoresin, which floats upon the surface, thus spoiling the appearance of the preparation, and possibly permitting too large a quantity of the active principle to be taken with the first doses from the bottle. As the rule, such tinctures should not be combined with solutions, aromatic waters, or infusions. Preparations of vegetable drugs containing tannic or gallic acid should not be prescribed with iron, as this combination produces an unsightly mixture, and the iron is precipitated in an insoluble form A survey of the Materia Medica will afford many instances of the ineligibility of particular remedies in certain forms of combination. Volatile and corrosive substances or hygroscopic bodies should not be given with powders; bulky drugs should not be added to pills. In alkaloids of great physiological activity, such as strychnine, delphinine, or aconitine, the pill-form should not be resorted to on account of the danger of unequal mechanical division; and, in solution, it should be seen to that nothing be added that would render them insoluble. Some of the combinations, inexpedient from a pharmaceutical standpoint, are as follows:—

1. **Form Explosive Compounds.**—Chlorate of potassium and tannic or gallic acids. Bromine and alcohol. Nitrate of silver and creasote, or vegetable extracts containing glucose. Iodine and solutions of ammonia. Chromic acid and glycerin. Chloride of lime with sulphur. Spirits of nitric ether with certain fluid extracts. Calcium or sodium hypophosphite with dry powders, or when triturated alone.

2. **Form Unsightly or Undesirable Mixtures.**—Chloral with solutions containing alcohol. Vegetable tinctures containing oils and resins with water. Spirit of nitrous ether with potassium iodide, iron sulphate, tincture of guaiac, antipyrin, mucilage, tannic and gallic acids. Compound infusion of gentian with infusion of wild cherry or of cinchona. Copaiba and oils with watery preparations (unless attended by acacia or other emulsifying agent). Acids with ammoniated glycyrrhizin.

**Chemical incompatibility** is caused by chemical decomposition with the production of a compound (salt) having characters and reactions different from its components. It should be avoided, as the rule, except where expressly intended by the prescriber. A knowledge of chemistry will generally put the physician upon his guard, but there are special illustrations, which must be borne in mind, where the combination is particularly undesirable, and, when ordered in a prescription, will defeat the object of the treatment and bring discredit upon the attendant. The general rules of chemical incompatibility are usually stated as follows:—

As a rule, a remedy is not to be ordered in combination with its antidotes and chemical tests, especially if the latter depend upon the formation of an insoluble precipitate or a corrosive or poisonous salt. Thus, alkaloids are usually precipitated by mercurials and other metals, and may be destroyed by compounds containing free chlorine, caustic alkalies, or potassium permanganate. Tannic and gallic acids usually precipitate the alkaloids in a nearly insoluble form. The alkalies usually cause precipitation when added to solutions of metallic salts. Glucosides are decomposed by free acids or by emulsions.

**Special incompatibilities** will be studied in connection with individual drugs. Among those that are most likely to give trouble are preparations containing corrosive chloride of mercury, silver nitrate, solutions of iodine and iodides, arsenic, lead, quinine, strychnine, and tannic acid, and, as the rule, such combinations should be avoided and the agents given by themselves or simply in some vehicle. Care should be taken in mixing powerful oxidizing agents with easily-combustible bodies. Among the former are chromic acid, concentrated nitric or nitrohydrochloric acid, potassium chlorate or permanganate. Some of the latter are oils, alcohol, ether, glycerin, sulphur, and phosphorus. Mixtures of chromic acid and glycerin or alcohol, as already stated, are explosive; so is silver nitrate with a vegetable extract or glucose. Compressed pills of potassium chlorate sometimes explode from slight friction.

**Physiological incompatibility** is based upon the physiological action of drugs, the rule being that drugs having dissimilar effects upon special organs should not be combined in one prescription, especially where the principal action of the drugs is antagonistic. Inasmuch as the effects of individual remedies are not restricted to one organ or set of organs, and as it never happens that two drugs will be found exactly opposed to each other throughout their whole range of action, considerable latitude in this respect is permitted in prescribing. In fact, there is sometimes an advantage in modifying the activity of a drug by one which is antagonistic. For instance, morphine and atropine are opposed in their effects, and yet atropine is very frequently added to an opiate to diminish the disagreeable effects,—headache, nausea, and constipation,—and heighten the sedative and anodyne qualities. Illustrations of such incompatibility are largely to be found under the antidotes to the toxic effects of drugs, a remedy being considered incompatible with its physiological antagonists, as the general rule, to which, as already stated, exceptions may be often taken. Some prominent illustrations are the following:—

Acetanilide: Alcohol, ammonia, caffeine, cardiac stimulants.
Aconitine: Alcohol, ammonia, atropine, amyl nitrite, digitalis, strophanthus, strychnine.
Agaricus albus: Opium, strychnine, pilocarpine.
Agaricus muscarius: Atropine, digitalis, stimulants.
Alcohol: Ammonium acetate, digitalis, strychnine, caffeine, hyoscyamine.
Atropine: Aconitine, chloral hydrate, hydrocyanic acid, jaborandi, muscarine, morphine, physostigmine (eserine).
Caffeine: Opium.
Chloral hydrate: Ammonium salts, atropine, alcohol, many alkaloids.
Chloroform: Amyl nitrite, ammonia, digitalis, strychnine.
Digitalis: Aconite, muscarine, saponin.

Gelsemium: Opium, atropine, strychnine.
Hydrocyanic acid: Atropine, hyoscyamine.
Morphine: Atropine, caffeine, nicotine, physostigmine.
Muscarine: (See Agaricus muscarius.)
Opium: Atropine, gelsemium, veratrum viride.
Physostigmine: Atropine, chloral hydrate, morphine.
Saponin: Digitalis, strophanthus.
Strychnine: Amyl nitrite, chloral, potassium bromide.
Veratrum viride: Opium.

The risks of incompatibility in prescribing can be entirely avoided if due precaution is taken. Whenever a new combination is ordered, the prescriber should take it himself to the pharmacist and personally supervise the preparation of the prescription, and examine the completed product. If an insoluble precipitate be formed, it should be at once investigated and its character determined. Very often a skilled pharmacist will be able to detect an incompatibility in a prescription, owing to his practical acquaintance with the combining of drugs, and in this way point out the fact that such an unintentional incompatibility may exist, and thus show his willingness to work with the physician. It is expected by the general community that a physician should be able to recognize a remedy or preparation by its physical characters alone. In order to do this it will be necessary for him to cultivate a close acquaintance with drugs and the results of combinations which he wishes to order, so that he may pronounce a verdict upon a preparation and decide whether or not it is properly compounded. If he has not such technical knowledge he should make it his business to acquire it in a laboratory or a pharmacy.

**Form and Language of the Prescription.**—For many reasons formulæ are usually written in the Latin language. However, if any physician choose to write his prescriptions entirely in English he is at liberty to do so; but the demands of accuracy require that he write the officinal English titles without abbreviation. Such titles as muriate of ammonia, balsam of copaiva, saltpetre or nitre, brown mixture, spirits of turpentine, etc., may be used in conversation, but in prescriptions the correct titles should be given: either **ammonii chloridum** or ammonium chloride; **copaiba** (not a balsam); **potassii nitras** or potassium nitrate; **mistura glycyrrhizæ composita** or compound licorice mixture; **oleum terebinthinæ** or oil of turpentine, and so on. Many popular titles are very objectionable; thus, oxalic acid is sometimes called essential salt of lemons or salt of sorrel, lead acetate is called sugar of lead, while an attempt to trace the vulgar names of plants leads to endless confusion. Sometimes preparations of different strength may be indicated; thus, prussic acid may mean concentrated acid or the official 2-per-cent. dilute acid; oil of almonds may mean oil of sweet almonds or oil of bitter almonds, which differ very much in their properties and effects. The only safe rule, therefore, in writing prescriptions, is to know exactly what is intended to be ordered and to legibly write the scientific name and quantity of the article desired, and if this is done the language may be left to the choice of the prescriber. As a rule, it will be found that physicians who are competent to do so prefer to write in Latin, and those who cannot write them correctly in the language of the pharmacopœia cannot write them correctly in English either.

As to the form of a prescription, it is essentially a communication from a physician to the pharmacist, directing the preparation of the remedy; by tacit consent of all parties, it is acknowledged to be the property of the patient, who has the privilege of having it repeated or refilled at his pleasure. When the prescription is marked "not to be repeated," the patient is understood to assume all the responsibility of any injury which he may experience from disobedience to the physician's directions, the pharmacist generally satisfying his conscience by calling attention to the fact that the physician did not desire the remedy to be continued, and protesting that the entire responsibility must rest with the patient, but filling the prescription just the same. In this way the alcohol habit, the opium habit, the chloral habit, the cocaine habit, the antipyrin or bromide habit are fostered by the resources of modern pharmacy, which presents these agents in the form of cordials and other attractive preparations; so that physicians hesitate to prescribe them, for fear of the consequences of making patients acquainted with these seductive preparations, as there is practically no restriction on their sale.

Besides the formula, the complete prescription contains instructions to the pharmacist concerning the combining or compounding of the medicine and directions to the patient as to the quantity, manner, and time of taking the preparation. Finally, the document must be signed and dated, and, as a matter of precaution, it is advisable to write upon it the patient's name and address, so that, if the pharmacist should make a mistake or deliver the wrong medicine, he will be able to trace it at once. This is also a safeguard against error in administration where more than one patient is under treatment in a family or institution.

Proceeding to the actual framing of prescriptions, assuming a knowledge of the Materia Medica and pharmacopœial titles sufficient to enable the prescriber to determine what remedy he wishes to give and its dosage, he writes upon a piece of paper, as legibly as possible, the formula that he has in his mind, making the case-endings agree with the requirements of the situation. For instance, as the first word is "Recipe," the imperative mood of the verb "take," requiring the accusative case, it follows that the nouns which follow referring to quantity should be considered as in the accusative case. Thus, "Recipe, gr. j, or ʒij," means, "Take 1 grain or 2 drachms" of any desired agent. The latter, however, must be placed in the genitive case whenever the quantity is expressed; thus, ℞ Aquæ calcis, fʒiv," means, "Take 4 drachms of lime-water." On the other hand, when the quantity is not given in any denomination of weight or volume, the subject itself being directly taken, the latter is put in the accusative case; thus:—

"℞ Vitellum ovi,
Aquæ cinnamomi, . . . . . q. s. ad f℥j;

means, "Take the yelk of an egg, and enough to make one ounce of cinnamon-water (water of cinnamon)," the letters q. s. standing for **quantum sufficiat**, or, as much as may be required to make up the amount specified. If the case-endings are known, the proper cases may be ascertained by trying to insert the word "of;" where this can be done the word following it should be written in the genitive case; thus, in water of cinnamon, or syrup of orange, the words cinnamon and orange will always be in the genitive case. To students unfamiliar with Latin, the difficulties in the way of correct writing of prescriptions may seem insurmountable; but they will disappear after a little attention and practice. One of the best ways of learning the genitive case of pharmacopœial nouns is to study the list of fluid extracts of tinctures in which the remedial agent is in the genitive (fluid extract or tincture of—). Familiarity with the names of the Materia Medica will supply the needed information in the majority of drugs regarding the case-endings.

The general form of the prescription is:—

℞ (for recipe, or take)
*Basis.* of A (in the genitive case), a certain quantity (in the accusative case).
*Adjuvant.* of B " " " " " " " "
*Corrigent.* of C " " " " " " " "
*Vehicle.* of D " " " " " " " "
*Pharmaceutical Directions.* Let such or such preparation be made.
*Directions to Patient.* Write (upon the label) the specific directions for dosage, time of taking, alone or with any vehicle, etc.
*Signature.* Physician's name.
*Date.*
*Name and Address of Patient.* For Mr. So-and-so.

It is not at all necessary that the classical arrangement of base, adjuvant, and so on, should be observed, but it seems natural to write the most important agent first, and follow this with any agent or agents which we desire to combine with it, and, finally, a menstruum or vehicle if any be needed. For illustration, suppose it is desirable to give a patient an expectorant cough mixture. In order to render the secretions more liquid we may use potassium iodide, or a vegetable substance, like ipecacuanha, and, perhaps, may decide to combine them. Associated with them we may give ammonium chloride, which acts beneficially upon the bronchial mucous membrane, causing the development of more healthy epithelium. Finally, a suitable menstruum would make the mixture more palatable. We next decide upon the quantity for each dose, and the prescription now appears in this form:—

Recipe.

| | | |
|---|---|---|
| Potassii iodidi, | | gr. iij. |
| Ammonii chloridi, | | gr. xij. |
| Extracti ipecacuanhæ fluidi, | | ♏ij. |
| Syrupi sarsaparillæ compositi, | q. s. ad | f ʒ ij. |

Misce fiat mistura.

Or,

Take

| | | |
|---|---|---|
| of iodide of potassium, | | three grains. |
| of ammonium chloride, | | twelve grains. |
| of fluid extract of ipecac, | | two minims. |
| of compound syrup of sarsaparilla, | enough to make | two drachms. |

Mix. Let a mixture be made.

Having settled that a dessertspoonful, or 2 drachms, will be a sufficient dose to give, we decide upon the number of doses to be ordered. If twenty be the number selected, the entire prescription will then equal twenty times two drachms, or five fluidounces, and, when completed, will form a mixture, with directions like the following:—

℞ (abbreviation).
Potassii iodidi, . . . . ( 3×20 = 60 grs. or) ʒj.
Ammonii chloridi, . . . (12×20 = 240 grs. or) ʒiv.
Ext. ipecacuanhæ fluidi . ( 2×20 = 40 ♏ or) ♏xl.
Syr. sarsaparillæ comp., . . ( 2×20 = 40 ʒ or) q. s. ad f℥v.
M. fiat mistura.
Signa: Take a dessertspoonful every four hours for cough, as directed by
*Phila., Sept. 30, 1895.* Dr. X.

Another illustration may be taken:—

℞
*Base.* Quininiæ sulphatis, . . . . . . . . gr. xlviij.
*Adjuvant.* Acidi sulphurici diluti, . . . . . . . . fʒj.
*Corrigent.* Tincturæ cardamomi compositæ, . . . . f℥vij.
*Vehicle.* Elixir, . . . . . . . . . . . . . f℥iij.
Sig.: Take a teaspoonful with water after meals. Dr. A.

The principal object of the addition of the sulphuric acid is to increase the activity of the quinine by changing it into the more soluble bisulphate. The compound tincture of cardamom makes the mixture more acceptable to the stomach, and increases the tonic effect, in which the alcohol, both of the tincture and the elixir, will participate. Where the alcohol is objectionable, the syrup of orange may be substituted for the elixir.

There is no essential difference between prescriptions for internal remedies and those for topical or local use as regards their form; for instance, we may write as follows:—

℞ Olei tiglii, . . . . . . . . . . . fʒj
Olei amygdalæ expressi, . . . . . . . . fʒij.
M. Sig.: For external use. Apply with a camels-hair pencil, once daily, over a space as large as a silver dollar, as directed. Dr. B.

℞ Acidi gallici, . . . . . . . . . . . fʒj.
Glycerini, . . . . . . . . . . . . f℥j.
M. ft. solutio.
Sig.: Apply, night and morning, to the throat as directed. Dr. C.

℞ Potassii chloratis, . . . . . . . . . ʒij.
Glycerini, . . . . . . . . . . . . f℥j.
Ext. geranii fld., . . . . . . . . . . fʒiv.
Aquæ rosæ, . . . . . . . . . q. s. ad f℥vj.
M. ft. gargarisma.
Sig.: Use as a gargle several times daily, diluting with water if necessary.
Dr. D.

**Time and Interval in Relation to Dosage.**—In addition to the question of dosage and the proper form in which to administer remedies, the problem of the frequency of giving the dose must be decided; and the time of the day, the relation to meal-time, all come up for settlement. The old and prevailing three times daily or *ter in die* method of ordering medicine to be taken arose from the natural division of time and the custom of eating a morning, noon, and evening meal. Remedies affecting the stomach directly are usually given when the organ is empty,—that is, before meals,—while digestive agents, to assist the assimilation of food, would properly be administered during the period of digestion. Systemic remedies, in a similar manner, are best given a short time after meals, so as to mix with the food and be absorbed with it and so enter the circulation. Laxative pills may be taken after the principal meal of the day (dinner-pills), or, if they contain cathartics of a slowly-acting character, they are best given upon retiring at night, so that in case they cause griping it will not give so much pain or inconvenience as if it occurred during the day. On the other hand, salines, such as Rochelle or Epsom salts, or natural purgative waters containing them, are more efficient when taken early in the morning, when the stomach and intestinal tract are not occupied in digesting food, and are thus more directly affected. It is sometimes of importance that the bowels should be moved just before retiring at night; for instance, where there are hæmorrhoids, it is found that they are liable to come down during the act of defecation, and afterward to cause pain and irritation during the time the patient is in the erect posture. In such a case a laxative, such as compound licorice powder or rhubarb, may be given at an hour in the afternoon which a little experience will determine, so as to bring about the desired result. Narcotic and sedative remedies are more effective if given just before the patient is accustomed to sleep: just as bitter tonics intended to excite the appetite should be given a little before the times appointed for the meals. Remedies may be given for a temporary purpose, as where alum and molasses or an ipecac mixture is ordered for croup, or preparations ordered for headache or cough, which are to be discontinued as the symptoms are relieved or the object of the treatment is accomplished. In treating a patient who has a tape-worm it is considered advisable to have the intestinal tract nearly empty, and the action of the remedy is greatly assisted by a preliminary purging to carry off the mucus which is thrown out as a result of the irritation caused by the parasite. For the administration of a purgative or the removal of a tape-worm the medicine is frequently taken on Saturday night, so as to enable the patient to rest the following day in case of overaction of the drug. When it is desired to evacuate the stomach by an emetic, it is advisable that some warm water or gruel shall be swallowed, so as to moderately distend the organ and give the muscles something to contract upon. On the other hand, when vomiting is not desirable, as when ipecac is administered for dysentery and it is not intended to berejected by the stomach, the patient should abstain from drinking water before or after taking the medicine. Seasons and locality have some effects upon dosage: in hot weather the system does not bear strong medication as well as in winter-time. In some localities, where malaria is rife, antiperiodics must be given in larger doses, and are required in almost every disease. The numerous modifying elements that arise from circumstance and place, or the condition of particular organs, will receive due attention in another part of this work.

The **modes of administration**, from a pharmaceutical standpoint, have already been referred to, but a few words remain to be said from the therapeutical or physiological point of view. Remedies produce systemic effects because they enter the blood and become a part of the circulating fluid, or they may occasionally produce an impression upon the peripheral nerves, and thus produce local or remote effects, owing to reflex action. It must also be admitted that disturbances of function, similar to those produced by medicines, may be produced by emotion or mental states. In certain very sensitive subjects, usually hysterical, it has been found, in Charcot's clinic, that the effects of remedies can be obtained by "suggestion," without administration of the remedy. This is very similar in principle to the metallotherapy of Burq and to the tractotherapy of Perkins. The subject just adverted to will be further discussed in the chapter upon Hypnotism and allied states. For the present we are concerned with the actual physiological action of remedies, which may enter the circulation (1) by the mouth and stomach, (2) by the rectum, (3) by the bladder or vagina, (4) by the skin, (5) by the broncho-pulmonary mucous membrane, and (6) by the veins or granulating surfaces.

1. The mouth being the natural channel for the introduction of food or sustenance, it seems the most convenient route for the administration of medicines, and, in fact, is thus used as the rule. Nature has placed a sentinel here in the form of the gustatory nerves and papillæ, and innumerable expedients have been resorted to in order to enable badly-tasting remedies to pass without exciting repugnance or nausea. Patients differ greatly with reference to their ability to take medicines. Some can take castor-oil with a relish, others enjoy asafœtida as a condiment to their food; some are so sensitive that they are nauseated even by the idea of taking medicine of any kind. The latter often tax the resources of the pharmacist and physician until some other channel is finally selected for introducing the remedy. The absorption of medicines is largely by means of the capillaries or small veins, but the lymphatics or lacteals also participate. After entering the blood the remedies are carried by it into the capillaries of the central nervous system and the various organs of the body. After remaining in the tissues for a greater or less length of time, and exerting certain characteristic effects upon the functions of the several organs, these agents again enter the circulation, and are excreted from the system by the emunctories. As a rule, the remedy acts as an excitant or stimulant to the organ by which it is separated from the blood. They are subsequently to be found in the various secretions and excretions, either in their original form or some derivative of it. The absorption of insoluble substances is dependent upon their being transformed into soluble form; this may be done by the acid gastric juice or the alkaline intestinal juice. In some cases of ingestion of corrosive poisons the individual may perish from shock, or spasm of the glottis; but, as the rule, there is sufficient time for absorption of the poison from the alimentary canal before death occurs, When a toxic agent has been swallowed it is important to evacuate the stomach and intestines at once, so as to prevent the continued absorption of the poison.

2. Remedies may be introduced by **enema,**—otherwise called injection, lavement, or clyster. In this instance the mucous membrane of the rectum takes the place of the lining membrane of the stomach. There can be no question with regard to the absorption of remedies by the bowel, since it can be readily demonstrated. Thus, suppositories of opium

produce the usual systemic effects of this drug; quinine, introduced into the rectum, stops intermittent fever; nutritive enemata support life for months, and so on. Injections of starch, with laudanum, are especially useful in painful affections of the rectum or the other pelvic organs, and check secretion in diarrhœa or dysentery. When an enema is to be retained it should not be more than from 1 to 4 ounces, according to circumstances; as a lavement or clyster, as large an amount as can be borne by the patient without causing actual pain may be given,—thus, from 2 to 4 pints may be injected into an adult, from one-eighth to one-fourth this quantity for a child, or 1 or 2 ounces for an infant. The instrument used for this purpose is called a syringe. It may be the classical form, with a piston and receiver, the latter being furnished with a tube, through which the fluid is forced when the piston is forced down. The best are made out of hard rubber; those made of pewter or glass are very inferior. In addition to these, we have the soft-rubber tube, terminating in a tube of metal or of hard rubber; in the course of this tube there is a rubber bulb, which, expanding after compression, exercises suction, and, by alternate compression and expansion, forces fluids along the tube. This is a great improvement over the old style, as it is easily operated and can be used as a self-injecting apparatus. The fountain-syringe is simply a rubber bag or receiver, of variable capacity, terminating in a tube, through which the water flows by force of gravity when the reservoir is elevated. A pneumatic syringe is also made, in which the solution is placed and is afterward forced through the tube by pumping air into the bottle, reversing the aspirator of Dieulafoy. The ordinary injection used for evacuating the bowel consists of warm water containing some Castile soap in solution. In addition to this, we may add 1 or 2 ounces of castor-oil or a teaspoonful or more of oil of turpentine, in order to make the injection more stimulating. Glycerin may be used for the same purpose, from 1 to 4 drachms being generally sufficient to evacuate the lower bowel. When **gaseous enemata** are administered, the gas diffuses rapidly into the blood, and is excreted by the lungs. It was thought that the introduction of sulphuretted hydrogen in this way might benefit tubercular lesions in the lungs (Bergeon's method); but it has not been found to be of much service clinically, and certainly not sufficient to warrant its employment in opposition to the many obstacles that suggest themselves to this method.

3. The bladder or vagina may be used for the administration of remedies; but usually agents here applied are only intended to act locally. A weak solution of silver nitrate, or of some sedative antiseptic,—boric acid or carbolic acid,—is sometimes resorted to, with excellent effect, in cases of inflammation; but remedies are rarely, if ever, introduced by this channel into the system, although morphine, atrophine, or other active remedies might be so administered.

4. The skin, or general surface, may be utilized in several ways for the introduction of medicines. In the first place, the agent may be simply applied to the surface and kept in contact with the skin,—the **enepidermic method.** Friction may be called to our assistance to force the agent through the skin,—the **epidermic method.** The cuticle may be removed by a blister or other means, and the agent applied directly to the derma,

—the **endermic method.** Remedies may be introduced beneath the skin and thrown into the areolar tissue,—the **hypodermic method.** With regard to the first three but little need be said. There are in use a large variety of lotions and liniments, some of which are active counter-irritants, which are used principally for a local effect. At the same time, remedies can be thus made to produce a systemic effect, as where mercurials are applied by inunction; or quinine is used in the same way. Occasionally, medicines applied to the surface for a local effect may produce a general one, as where a belladonna ointment or plaster produces dilated pupils or croton-oil causes a general eruption. The last-named or hypodermic method, however, will require a more extended notice.

By the subcutaneous or hypodermic method, remedies in a state of solution are introduced by means of a small syringe armed with a hollow needle which is made to perforate the skin. This plan was first brought to the notice of the profession by Dr. Alexander Wood, of Edinburgh, and, being adopted, soon acquired a remarkable popularity. It has some decided advantages over ordinary methods, in that it admits of greater precision in dosage, since the entire dose rapidly enters the circulation; whereas, given by the mouth, some may escape absorption. It produces prompt effects, the influence being observed in from five to fifteen minutes, which makes it invaluable in the case of pain. It combines a local with a general effect, as, according to Dr. Wood, the injection should be administered as near to the site of pain as possible. It is clean, it is convenient, and it is cheap because the patient has it given to him. On the other hand, if an overdose be accidently administered the poisoning must be met by physiological antidotes, since it cannot be withdrawn from the circulation after being injected. If the needle be not strictly aseptic it may communicate disease, and instances have been known of pyæmia and tetanus following the use of the hypodermic needle. The greatest objection of all is that, by its use, patients are taught the morphine habit, and are apt to become infatuated with the little instrument and the effects of the punctures, and soon become confirmed morphinomaniacs. It is the latter consideration particularly which has induced physicians to use the hypodermic needle with increasing caution, and to refrain from its use whenever the remedy can be given by the stomach.

The hypodermic syringe is usually made of glass, of twenty- to sixty-minims' capacity, the gradations being engraved upon the barrel or the piston-rod. The needles may be of steel or platinum; if of the former they may be gold-plated. Various modifications have been made in the size and shape, but the form used by Dr. Robert Koch, of Berlin, has an advantage, from an antiseptic standpoint, in that it is free from a piston and plunger. The fluid is sucked up by aspiration, by means of a rubber ball attached to the end of the syringe and, by compression of the ball, is again forced out. The needle is fitted upon the glass barrel by a carefully ground friction-joint, and the whole instrument can readily be taken apart and washed with antiseptic solutions or treated with hot water. The construction of the syringe is readily understood from the foregoing, but a more extended description can be found in the *Medical Bulletin* of

February, 1891, by those especially interested in the Koch treatment and its technique. It may be stated that the American imitations of the Koch syringe are unsatisfactory and practically worthless from want of care in manufacture. Bartholow, who has given much attention to this method, especially recommends a silver-plated instrument having a flat side to the piston-rod, upon which is marked the quantity of solution contained in the barrel. He makes the proper suggestion that, before using such an instrument, it should be carefully tested with a standard minim-glass, in order to see that it is properly graduated. The instrument must be kept surgically clean; the needles should be small and sharp, and the syringe frequently washed with antiseptic solution, in order to keep the packing of the piston in good order and prevent it from becoming dry. As regards the solution, it should be chemically pure and made with great accuracy, and not too concentrated. It should be fresh, because a fungus will develop in the course of a few days (*penicillium*), which destroys the alkaloid. Where the syringe is not frequently used it is better to rely upon extemporaneously prepared solutions made with recently boiled water, and powders, compressed tablets, or triturates containing the desired quantity. Distilled water that is not fresh is not so good as recently boiled water for making the solutions. Chloroform water, cherry-laurel water, or dilute carbolic-acid solutions will keep for a comparatively long time without spoiling.

In administering a hypodermic injection, a part of the skin free from superficial veins should be selected; if the piston be pulled out slightly when the needle is in position, and blood is seen to flow into the syringe, the needle should be withdrawn and another spot selected. Profound narcotism (possibly fatal coma) might result from the injection of morphine directly into the circulation by puncture of a vein. The place being selected,—generally in the outer aspect of the arm or forearm, or on the back,—the skin is pinched up into a fold between the forefinger and thumb of the operator's left hand. The needle is then introduced lengthwise into the fold, which is slightly elevated as the desired amount is injected; the needle is withdrawn from the little wound by a twisting motion, and the puncture rubbed a little with the finger. A small tumor or swelling is caused by the injection, which is dispersed into the cellular tissue by rubbing. No further attention to the puncture is necessary, although, if it be painful, the next day it may be washed with carbolized water (ʒj to Oj) as a local sedative as well as antiseptic. The following are frequently employed for hypodermic medication :—

| | | |
|---|---|---|
| Alcohol, | Dose, | ♏x–xxx. |
| Æther, | " | ♏xx–xxx. |
| Ammoniæ (aqua), | " | ♏x–xxx. |
| Apomorphinæ hydrochloras, | " | gr. $\frac{1}{16}$. |
| Arsenicum (Fowler's solution), | " | ♏ii–v. |
| Acidum carbolicum, | " | gr. $\frac{1}{6}$–ij. |
| Amyli nitris, | " | ♏iii–v. |
| Atropinæ sulphas, | " | gr. $\frac{1}{120}$–$\frac{1}{80}$. |
| Atropinæ et morphinæ sulphas, | " | gr. $\frac{1}{160}$–$\frac{1}{120}$ and gr. $\frac{1}{4}$–$\frac{1}{3}$ resp. |
| Caffeinæ citras, | " | gr. i–ij. |

℞ Caffeinæ, . . . . . . . . . . gr. xcvj.
Glycerini,
Aquæ, . . . . . . . . . . āā f℥ss.
M. Ten minims contain two grains.

| | |
|---|---|
| Cocainæ hydrochloras, | Dose, gr. i–ij. |
| ℞ Cocainæ hydrochlorat., | gr. xij. |
| Aquæ aurantii florum, | f ʒ iv. |

M. Twenty minims contain one grain.

| | |
|---|---|
| Curare, | Dose, gr. $\frac{1}{20}$–$\frac{1}{3}$. |
| Coniinæ hydrobromas, | " gr $\frac{1}{48}$. |
| Chloroformum purificatum, | " ♏v–xv. |
| or Spiritus chloroformi, | " ♏xx–xl. |
| Chloral, | " gr. x–xv. |
| Colchicina, | " gr. $\frac{1}{100}$–$\frac{1}{60}$ |
| Duboisinæ sulphas, | " gr. $\frac{1}{150}$–$\frac{1}{60}$. |
| Ergota, | " gr. ii–iij. |

| | | |
|---|---|---|
| ℞ Ext. ergotæ fld. (Squibb's), | | |
| Glycerini, | | |
| Aquæ, | āā | ℥j. |

M. Sig.: Use twenty to thirty minims by injection.

| | | |
|---|---|---|
| Hyoscina, | | Dose, gr. $\frac{1}{100}$. |
| ℞ Hyoscinæ hydrobromat., | | gr. $\frac{1}{5}$. |
| Glycerini, | | ♏xx. |
| Aquæ, | q. s. ad. | ♏c. |

M. Sig.: Five minims contain $\frac{1}{100}$ grain.

| | |
|---|---|
| Hyoscyamina, | Dose, gr. $\frac{1}{100}$. |
| ℞ Hyoscyaminæ sulphat., | gr. ss. |
| Aquæ chloroformi, | f℥j. |

M. Sig.: Ten minims constitute a dose, gr. $\frac{1}{96}$.

Hydrargyrum (see pages on Hydrargyrum, in Part III).

| | |
|---|---|
| Morphinæ sulphat., | Dose, gr. $\frac{1}{6}$–$\frac{1}{2}$. |
| ℞ Morphinæ sulphat., | gr. viij. |
| Acidi carbolici, | gr. iij. |
| Aquæ, | f℥j. |

M. Sig.: Ten minims equal gr. $\frac{1}{6}$. Powders or capsules may also be used.

| | |
|---|---|
| ℞ Morphinæ sulphat., | gr. iv. |

M. et divide in chartæ vel capsellæ no. xxiv. Each contain gr. $\frac{1}{6}$. To be used for making an extemporaneous solution.

| | |
|---|---|
| Quininæ hydrobromas, | Dose, gr. i–x. |
| ℞ Quininæ hydrobromat., | gr. xxiv. |
| Aquæ destillatæ, | f℥j. |

M. Sig.: Ten minims contain one grain of quinine.

| | |
|---|---|
| ℞ Quininæ sulphovinat., | gr. cxx. |
| Aquæ chloroformi, | f ʒ iv. |

M. Sig.: Ten minims contain five grains.

The quininæ bimuriata carbamidata, the double chloride of quinine and urea, is soluble in an equal part of water, and is especially adapted for hypodermatic injection.

| | | |
|---|---|---|
| Strychninæ, | | Dose, gr. $\frac{1}{60}$. |
| ℞ Strychninæ sulphat., | | gr. $\frac{1}{5}$. |
| Acid. acetic. dil., | q. s. ad | solve. |
| Aquæ acidi carbolici, | q. s. ad | f ʒ iv. |

M. Sig: Twenty minims contain $\frac{1}{60}$ gr. strychnine.

Many other instances of eligible forms for the administration of drugs hypodermically will be found, in the following pages, under the drugs concerned.

**Parenchymatous injection** is a form of hypodermic injection in which the solution is thrown deeply into the tissues instead of merely under the skin. It is employed in cases of neuralgia to deposit the remedies closely in contact with the affected nerve. Bartholow formerly used chloroform in this way, with marked benefit in cases of sciatica. Bichloride of mercury has been injected into the lung-tissue in the treatment of acute and chronic pneumonitis. Carbolic acid, or tincture of iodine, has been injected into the cavity of the tunica vaginalis testis in the treatment of hydrocele; and acetic acid and ergot have been thrown into the substance of various new growths. Ether has caused the disappearance of sebaceous tumors when injected into their interior, and parenchymatous injections of cocaine are used as a local anæsthetic.

5. By **inhalation,** remedies may be introduced, through the route of the bronchial mucous membrane, into the blood. Although rarely employed, except as a means of local medication, this method promises, in the future, to play a more important part in therapeutics. The remedies may be in the gaseous form, as where oxygen or nitrous oxide is administered ; they may be in a vapor, and inhaled with steam ; or made into a spray with the atomizer, and thus inhaled; or they may be used in fumes, as where tar or asthma pastilles are burnt, or sulphur or mercury vaporized. Concerning the extravagant hopes that have lately been raised (especially in the treatment of pulmonary consumption) of the bactericidal effects of inhalations, the results have not been very favorable. When the smaller bronchial tubes and air-cells and their walls are filled with bacteria the only antiseptic that can reach them is that contained in the healthy white blood-cell. At the same time salicylic acid, sodium benzoate, sodium chloride, and other agents are capable of being introduced into the ramifications of the bronchial tubes, and, by liquefying and favoring the expulsion of the secretions and making them less septic, they are capable of affording much relief to the patient and retarding the progress of the disease, if not hastening the cure. Hay fever is much relieved by applications of cocaine and inhalations of weak solutions of quinine; a similar treatment may sometimes be devised for acute and chronic pulmonary affections. For the production of a fine spray by mechanical action, instruments known as atomizers are used. Hand-atomizers consist of bulbs, which, by compression, deliver a blast of air through a tube past a capillary orifice in another tube, the latter being partially immersed in water or other desired solution. The blast of air produces a partial vacuum, and the fluid ascends the tube until, escaping by drops, it is blown into fine spray at right angles to the extremity of the tube. This is a very convenient instrument for small quantities of medicated solutions. When the quantity is larger the hand would become tired, and steam may be resorted to, as in Codman and Shurtleff's well-known instrument, or we may use compressed air by means of an air-pump. Some very neat and even ornamental forms of the latter have been devised by ingenious instrument-makers, and they may now be met with in the offices of all physicians who pay special attention to treatment of diseases of the throat or nose.

6. The **intra-venous administration** of medicine is the most direct method at our command of obtaining prompt physiological effects

from our remedies. The transfusion of blood is an ancient therapeutic device, and it naturally suggested the employment of remedies in the same manner. In the collapse of cholera intra-venous saline injections have saved numerous lives that were apparently in a hopeless condition. The formula adopted by Hayem is:

| | |
|---|---|
| Sodium sulphate, . . . . . . . | gr. 390. |
| Sodium chloride, . . . . . . . | gr. 80. |
| Sodium hydrate, . . . . . . . . | gr. 15½. |
| Water, . . . . . . . . . . . | fld. oz. 3. |

This should be filtered and brought to the temperature of the blood at the surface, or not more than 100° F. Of such a solution as much as 2 quarts have been used at one operation, but, as a rule, 1 quart will be quite sufficient. It is important to inject the fluid slowly, so as to imitate the natural blood-current. Solutions of sodium phosphate and chloride (specific gravity about 1020) have also been employed with success. The late Dr. Fagge employed the latter solution in the treatment of diabetic coma with remarkable improvement after 26 ounces (imperial) had been thus used. In cases of collapse from hæmorrhage milk has been employed by a number of operators, with gratifying results. Halford, of Australia, has shown that, after a wound from a venomous snake, the intra-venous injection of aqua ammoniæ fortior (1 part) with aqua destillata (2 parts) is well borne and aids the system in sustaining itself under the effects of the poison, although it may not be directly antidotal, as was at first supposed. Dr. Eskridge has used undiluted aqua ammoniæ fortior, injected into the blood-current, without bad consequences and with recovery of the patient, who had been asphyxiated with hydrogen sulphide. It is also of service in thrombosis of the pulmonary artery, chloroform asphyxia, hydrocyanic poisoning, etc. The danger of admitting air into the vein may readily be averted with a little care. It is hardly necessary to add that the lancet, and, in fact, all of the instruments should be surgically clean, and, that every antiseptic precaution should be scrupulously observed.

**Transfusion of blood** has been performed many times, and various modifications of instruments have been invented to accomplish it. The trouble is, that when the emergency arises the instruments are not at hand, except in a large general hospital, and the practitioner must extemporize a transfusion apparatus out of a 4- or 6-ounce syringe and a rubber and glass tubes. Immediate transfusion is where the blood flows from the donor's blood-vessel into the recipient's, through a tube which had been previously filled with an antiseptic solution. A syringe may be introduced, so as to measure the amount of blood, as in the instrument of Martin, of Berlin. The instrument of Aveling, of London, is simply a rubber tube with a bulbous enlargement in the middle. The capacity of the bulb is 2 drachms. Silver cannulas are placed at the ends of the tube, which is about fifteen inches in length. Each cannula is guarded by a stop-cock, and the ends are beveled or rounded, so as to facilitate the insertion. The mode of operation is to carefully cleanse the apparatus by immersion in warm, recently boiled water. The air is entirely expelled, and a warm saline solution used to completely fill the tube. The veins of the donor and recipient being selected,—generally in front of the elbow,—the incision is made with a scalpel and a tube inserted into each, and held in place by the fingers of an assistant in preference to a ligature. Now, the stop-cocks being turned, the tube is pinched on the side toward the donor, and the fluid is forced onward; the afferent tube is then pinched, and the bulb allowed to slowly refill, when it is again emptied and again refilled until the proper quantity of blood (6 to 8 ounces usually) has been delivered. The apparatus is then withdrawn, a ligature placed upon the veins, and a proper dressing applied.

In **mediate transfusion** the blood is drawn into a warm bowl, beaten or whipped with some broom-straw to remove the fibrin and prevent subsequent clotting; then the blood is taken up into a previously warmed syringe and slowly injected, through a cannula, into the vein, the median basilic generally being chosen for the purpose. In this way repeated charges may be slowly and gently delivered, but, as Bartholow insists, from 4 to 8 ounces of blood will usually be sufficient to strengthen the heart and avert threatened collapse. The use of lambs' blood was advocated by Gesellius and others, but the transfusion was generally followed by a rigor and sweating, which greatly prostrated the patient.

Transfusion has been practised in phthisis and other chronic diseases without benefit. It is of greatest service in acute emergencies, such as severe hæmorrhage (traumatic or post-partum), hæmatemesis, intestinal hæmorrhage, epistaxis, etc. In the hæmorrhage diathesis it has been successfully used by Dr. Buchser, of New York, but it has failed in simple anæmia. In acute poisoning by phosphorous or carbonic oxide transfusion has been resorted to successfully by a number of reporters. A modification of this method has been proposed by Albanese and Hueter in **arterial transfusion.** In this method an artery of one of the extremities is selected and divided (generally the radial or posterior tibial being taken), and the blood is injected just as in mediate transfusion. The advantage sought for is the prevention of clotting and the danger of embolism, and that there is less danger of the introduction of air. Where a large quantity is to be injected it might be better to employ this expedient, so as to avoid any danger of suddenly overwhelming a weak heart. The effects following the **transfusion of milk** have been found to be very much the same as those from the use of blood, except that albuminuria is more apt to follow. When milk is used it should be taken directly from the cow or goat, and after being carefully strained, without being allowed to cool, it should be gradually introduced into the circulation by means of the syringe and cannula. The results, in some cases, of the treatment after hæmorrhage have been to warrant further trial. At the same time, the report of those who have gone over the entire subject critically is, that nothing can be a complete substitute for human blood for the purposes of transfusion. The later plan of injecting a quantity of blood into a large serous sac like the peritoneum, as recommended by Ponfick, has found few followers, and, whereas some good results have been reported, others have occurred in which death resulted from peritonitis.

Medicines may be applied topically to wounds and granulating surfaces or injected into suppurating cavities. The fact that such agents may be absorbed and produce systemic poisoning should lead us to be careful in applying carbolic acid, corrosive sublimate, or other active antiseptics which have powerful toxic effects upon the human organism. Morphine may be sprinkled upon painful wounds for its sedative effects, and iodoform or carbolic acid also act as local anodynes, but when used too freely have caused fatal poisoning.

**Idiosyncrasy; Individual Peculiarities Affecting the Dosage or Mode of Administration of Drugs.**—Personal peculiarities on the part of the patient, as regards the effects of remedies, often cause serious embarrassment to the prescriber. They are usually attributed to **idiosyncrasy**; but this is merely a term wherewith to hide our ignorance of the real cause. One of the puzzles of experimental therapeutics is the occasional contrast in the action of remedial agents in different species of animals,—*e.g.*, pigeons are very slightly affected by opium and are not injured by a quantity which would be fatal in man; a deer can eat tobacco, or a rabbit belladonna-leaves, without producing toxic effects. Something of a similar character occurs among patients. It is simply impossible to anæsthetize some patients with ether, and we are obliged, in such cases, to resort to chloroform when a surgical operation is required. There is also a great difference with regard to susceptibility to the effects of alcohol; some persons are easily overcome by it, and quickly rendered helpless and unconscious; others can take very large amounts, and, while showing its physiological effects by inebriety, are not discommoded by it to the extent of losing control of themselves. Sometimes we encounter individuals who are rendered very uncomfortable by calomel, even a small dose bringing on neuralgia or gouty pains in the joints; others require quite large doses to produce any effects at all. Cinchona and its alkaloids (quinine, cinchonine, quinidine, etc.) sometimes cause disturbance of digestion and eruptions upon the skin, even purpura hæmorrhagica, cases of the latter having been reported by Dr. Woodbury.* The objections to taking quinine which we sometimes encounter are probably due to ignorantly confounding it with other agents, such as mercury. Some patients cannot take colchicum at all; others use it in large doses with only good results. Opium and its alkaloids, morphine especially, are often productive of unpleasant consequences; and, instead of soothing a patient and producing sleep, they occasion excitement, restlessness, headache, irritation of the skin (followed by vomiting and prostration), or an eruption resembling urticaria or erythema. In the same way potassium iodide, even in small doses, occasions severe coryza in some patients, while in others a vesicular eruption appears which is not unlike varicella or variola. Unexpected prostration and symptoms of poisoning have followed the administration of ordinary doses of chloral hydrate, terminating fatally, in spite of everything that could be done. This occurs so frequently from chloroform that its use as an anæsthetic has been abandoned by many surgeons, and by others it is employed only with great caution. Iodoform, as a surgical dressing, even may cause poisoning in certain susceptible persons. The new aromatic compounds, antipyrin, acetanilide, sulphonal, etc., occasionally excite a peculiar train of toxic effects, for which, as yet, no explanation, except idiosyncrasy, has been given. On the other hand, it is sometimes necessary to give large doses of quinine, opium, calomel, chloral, or potassium iodide, in order to produce a desired or positive therapeutic effect. When such unpleasant effects forbid the employment of a remedy it becomes necessary to resort to a substitute, or **succedaneum**, as it is called, having similar therapeutic effects without the objectionable features of the former agent.

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* Philadelphia *Medical Times*, September 18, 1886.

From all that has been said in the preceding pages, the explanation is easily given of the reason why the dose of a drug cannot be stated with the same definiteness as its specific gravity, for instance. While we can say that a certain quantity is a customary or usual dose, and that a larger quantity is the maximum dose, which, under ordinary circumstances, it is not well to exceed, at the same time we may find patients who cannot take even the ordinary dose without great discomfort, and others who actually require extraordinarily large doses before obtaining the anticipated therapeutic result. The Committee on Revision has very wisely left the question of dosage to be settled between the physician and the pharmacist. It is customary, when a very large dose is stipulated in a prescription, for the pharmacist to ascertain from the physician if the dose was intended or was due to a mistake, owing to haste or to interruption while writing it. Physicians can save delay, in a case where a large dose is intentional, by underlining it or putting a star after it, to indicate that notice has already been taken by the author of the prescription, and it is not necessary to call it to his attention again.

**Prescribing for Children.**—If the doses for adults are subject to such fluctuation and uncertainty, it is evident that any calculation by mathematical formula of the dose for a child at any given age, based upon the adult dose, must be unreliable. Several such schemes have been proposed. Thus, Dr. Young's plan was to diminish the dose in the proportion of a fraction whose numerator is a figure representing the child's age and the denominator the age of the child increased by 12. The rule would therefore be: Multiply the adult dose by a fraction expressed by 12 increased by a figure corresponding with the years of a child's age divided by the age. Thus, if a child's age is 6 years and the adult dose 20 grains, we have the following formula:—

$$20 \times \frac{6}{12+6} \text{ or } \frac{1}{3} = 6\frac{2}{3} \text{ grains.}$$

The fact that the development of children depends upon other factors than age is sufficient to show the fallacy of this scheme, especially if we remember that some children, like adults, are very susceptible to medicines. A somewhat more rational plan than the preceding is based upon the weight of the child, which is taken as the numerator of a fraction whose denominator is 140, which is arbitrarily taken as the average adult weight. Inasmuch as many circumstances besides the age and weight of an individual affect the question of dosage, and as this is even more evident in prescribing for children than among adults, we cannot advocate any such mathematical formulæ for ascertaining the dose for children. Caution should be observed in prescribing narcotics to very young children; a single drop of laudanum has caused the death of an infant, while, on the other hand, they bear, without injury, relatively large doses of belladonna, conium, arsenic, and of mercury. Ptyalism should never be intentionally set up in children by an excessive use of mercury, because it may be followed by inflammation and sloughing of the lips and cheek and other serious lesions. In writing a prescription for a child it is sometimes of advantage for the pharmacist to know the fact, which may be indicated by addressing it "for baby," or "for Willy or Mary," or simply "for Mr. Blank's child."

In concluding this part of the work, the following table will be found useful in reading and writing prescriptions:—

*Latin Terms and Phrases Employed in Prescriptions.*

| WORD OR PHRASE. | USUAL CONTRACTION. | ENGLISH EQUIVALENT. |
|---|---|---|
| A *or* Ab (prep. with ablative) | A *or* Ab | From *or* Out of. |
| Ad (with accusative) | Ad | To *or* Up to. |
| Adde | Add | Add. |
| Ad duas vices | Ad 2 vic. | In two takings *or* doses. |
| Ad tertiam vicem | Ad 3 vic. | At three takings *or* doses. |
| Ad libitum | Ad lib. | At pleasure. |
| Absente febre | Abs. feb. | Fever being absent. |
| Adstante febre | Ad. feb. | Fever being present. |
| Adhibendus | Adhib. | To be administered. |
| Admove | Admov. | Apply. |
| Aliquot | Aliquot | Several. |
| Alternis horis | Alt. horis | Every second hour. |
| Alvo adstricta | Alv. adstrict. | The bowels being bound. |
| Ana | āā | Of each. |
| Ante cibum | Ante cib. | Before food. |
| Aqua astricta | Aq. astr. | Ice. |
| Aqua bulliens | Aq. bull. | Boiling water. |
| Aqua ex flumine | Aq. ex flum. | River water. |
| Aqua fervens | Aq. ferv. | Hot water. |
| Aqua fluvialis | Aq. fluv. | River water. |
| Aqua fontis *or* fontana | Aq. font. | Spring water. |
| Aqua pluvialis | Aq. pluv. | Rain water. |
| Aqua pura | Aq. pur. | Pure water. |
| Bene | Bene | Well. |
| Bis in die | Bis die *or* Bisind. | Twice daily. |
| Bougia | Boug. | A long suppository *or* Bougie. |
| Bulliat | Bull. | Let it boil. |
| Capiat | Cap. | Take. |
| Caute | Caute | Cautiously. |
| Cibus | Cib. | Food *or* Meal-time. |
| Cochleare magnum | Coch. mag. | A tablespoonful. |
| Cochleare medium | Coch. med. | A dessertspoonful. |
| Cochleare parvum | Coch. parv. | A teaspoonful. |
| Cola *or* Coletur | Col. *or* Colet. | Strain. |
| Collyrium | Collyr. | An eye-wash. |
| Coloretur | Coloret. | Let it be colored. |
| Compositus | Co. *or* Comp. | Compound. |
| Congius | Cong. | A gallon. |
| Continuantur remedia | Cont. rem. | Continue the medicine. |
| Coque, Coquantur | Coq. | Boil. |
| Cras, Crastinus | Crast. | To-morrow. |
| Cras mane sumendus | Cras mane sum. | Take to-morrow morning. |

| WORD OR PHRASE. | USUAL CONTRACTION. | ENGLISH EQUIVALENT. |
|---|---|---|
| Cujus | Cuj. | Of which, of any. |
| Cujus libet | Cuj. lib. | Of any you please. |
| Cum (with ablative) | Cum | With. |
| Cyathus | C. *or* Cyath. | A glass. |
| Cyathus vinarius | C. vin. | A wine-glass. |
| Debita spissitudo | Deb. spiss. | Proper consistence. |
| Decubitus | Decub. | Lying down *or* A bed-sore. |
| De die in diem | De d. in di. | From day to day. |
| Diebus alternis | Dieb. alt. | Every other day. |
| Diebus tertius | Dieb. tert. | Every third day. |
| Dilue, Dilutus | Dil. | Dilute, diluted. |
| Dimidius | Dim. | One half. |
| Divide | Div. | Divide. |
| Dividatur in partes æquales | Div. in par. æq. | Let it be divided into equal portions. |
| Donec alvus soluta fuerit | Donec alv. sol. ft. | Until bowels are open. |
| Dosis | D. | Dose. |
| Drachma | Dr. *or* ʒ | A drachm. |
| Durante dolore | Dur. dolor. | During pain. |
| Eadem | Ead | The same. |
| Ejusdem | Ejusd. | Of the same. |
| E *or* Ex | E. | Out of, from. |
| Fac *or* Fiat | F. *or* Ft. | Make, *or* let be made. |
| Fac pilulas duodecim | F. pil. xij. | Make 12 pills. |
| Fervius | Ferv. | Hot. |
| Fiant chartulæ duodecim | Ft. chart. xij. | Let 12 papers be made. |
| Fiant pilulæ duodecim | Ft. pil. xij. | Let 12 pills be made. |
| Fiat emplastrum | Ft. empl. | Let a plaster be made. |
| Gargarisma | Garg. | A gargle. |
| Gradatim | Grad. | By degrees. |
| Gutta, Guttæ | Gtt. | Drop *or* Drops. |
| Guttatim | Guttat. | By drops. |
| Haustus | Haust. | Draught *or* Potion. |
| Horâ decubitus | Hor. Decub. | Bed-hour. |
| Horâ somni | Hor. som. | Bed-time. |
| Horæ unius spatio | Hor. 1 spat. | One hour's time. |
| Idem | Id. | The same. |
| In dies | Ind. | Daily. |
| Infrico | Infr. | To rub in. |
| Infusa | Inf. | Let it infuse *or* steep. |
| Intime | Int. | Thoroughly. |
| Jus | Jus | A broth (juice). |
| Linimentum | Lin. | A liniment. |
| Lotio | Lot. | A lotion. |
| Macero | Mac. | To macerate. |
| Magnus | Mag. | Large. |
| Mane | Mane | In the morning. |
| Mane primo | Man. prim. | First thing in the morning. |
| Medicamentum | Med. | A medicine. |
| Mica panis | Mic. pan. | Crumb of bread. |
| Minimum | M. *or* Min. | A minim. |
| Misce | M. | Mix. |
| Mitte | Mitt. | Send. |
| Mitte decem tales | Mitt. x tal. | Send 10 like this. |
| Modicus | Mod. | Moderate-sized. |
| Modo præscripto | Mod. præsc. | In the manner written. |
| Mollis | Moll. | Soft. |
| Morbus | Morb. | A sickness. |
| More dictu | Mor. dict. | In the manner directed. |

| WORD OR PHRASE. | USUAL CONTRACTION. | ENGLISH EQUIVALENT. |
|---|---|---|
| More solito | Mor. sol. | As accustomed. |
| Ne tradas sine nummo | Ne tr. s. num. | Deliver not without the money. |
| Nocte maneque | Noct. maneq. | Night and morning. |
| Nomen proprium | Nom. prop. | The proper name. |
| Non repetatur | Non repetat. | Let it not be repeated. |
| Octarius | O., Oct. | A pint. |
| Omni horâ (*or* Omnis horis) | Omn. hor. | Every hour. |
| Omnibus alternis horis | Om. alt. hor. | Every second hour. |
| Omni bihoris | Om. bih. | Every two hours. |
| Omni quadrante horæ | Om. ¼ h. | Every fifteen minutes. |
| Omni mane vel nocte | Om. mane vel noc. | Every morning or night. |
| Optimus | Opt. | Best. |
| Partes æquales | P. æq. | Equal parts. |
| Parvulus | Parv. | Small. |
| Penicillum camelinum | Penicil. cam. | Camel hair pencil. |
| Per (accusative case) | Per | Through *or* By. |
| Phiala prius agitata | P. p. a. | The bottle being first shaken. |
| Post (accusative) | Post | After. |
| Pro (ablative) | Pro | For *or* According to. |
| Pro ratione ætas | Pro rat. æt. | According to patient's age. |
| Pro re nata | P. r. n. | As occasion arises. |
| Quantum libet | Q. lib. | As much as pleases. |
| Quantum sufficiat | Q. suff. | As much as suffices. |
| Quâque horâ | Qq. hor. | Every hour. |
| Quoque | Quoq. *or* Q. | Also. |
| Quotidie | Quotid. | Daily. |
| Recipe | ℞ | Take. |
| Redactus in pulverem | Red. in pulv. | Powdered. |
| Repetatur | Repetat. | To be repeated. |
| Scrupulum | Scrup. *or* ℈ | A scruple (20 grains). |
| Secundum artem | Sec. a. | According to art. |
| Semi *or* Semisse | Ss. | A half |
| Semihora | Semih. | Half an hour. |
| Sesqui | Sesqui | One and a half. |
| Signa | Sig. | Write. |
| Simul | Simul | Together. |
| Sine | Sin. | Without. |
| Singulorum | Sing. | Of each. |
| Si opus sit | Si op. sit | If need exists. |
| Solve | Solv. | Dissolve. |
| Statim | Stat. | Immediately. |
| Stet *or* Stent | St. | Let it (or them) stand. |
| Subinde | Subind. | Frequently. |
| Succus | Suc. | Juice. |
| Sumat talem | Sum. tal. | Take one such. |
| Sume | Sum. | Take. |
| Talis | Tal. | Such a one. |
| Tere | Tere | Rub. |
| Ter in die | T. i. d. | Thrice daily. |
| Tritura | Trit. | Triturate *or* Grind. |
| Tussis | Tus. | Cough. |
| Ultimus præscriptus | Ult. præsc. | The last ordered. |
| Ut dictum | Ut dict. | As directed. |
| Vel | Vel. | Or. |
| Verus | Ver. | Genuine. |
| Vesper | Vesp. | The evening. |
| Vitellus | Vitel. | Yelk of an egg. |

# POISONS AND ANTIDOTES.

The following table is placed here for convenience of reference; for further details of treatment the reader is referred* to the paragraphs relating to toxic effects and antidotes under the individual titles in the section devoted to drugs.

A general formula for administration in cases of poisoning by an unknown agent is sometimes useful as a sort of universal antidote. Dr. Murrell recommends the following combination:—

| | |
|---|---|
| ℞ Liquor ferri sulphatis (ad saturandum), | 100 |
| Aquæ, | 800 |
| Magnesiæ, | 88 |
| Carbonis animalis purificatæ, | 40 |

The iron solution is to be kept separate from the mixture of calcined magnesia and animal charcoal until wanted, and then the ingredients should be put in a bottle and well shaken together. The solution should be drunk while the insoluble ingredients are in a state of suspension. A wineglassful at a dose, frequently repeated.

| *Poisons.* | *Antidotes.* |
|---|---|
| Acetanilide,<br>Antipyrin, | Diffusible stimulants, hot alcoholic drinks, hot coffee, stimulating enemata, hypodermic injections of atropine, digitalis, or nitroglycerin. |
| Acids:—<br>Acetic,<br>Hydrochloric,<br>Nitric,<br>Oxalic,<br>Phosphoric,<br>Sulphuric,<br>Tartaric. | Magnesia, chalk, dilute solutions of alkaline carbonates, soap, tooth-powder. Demulcents: milk, albumen, oils. |
| Alkalies:—<br>Caustic potash,<br>Concentrated lye,<br>Soda,<br>Lime,<br>Ammonia, etc. | Vinegar, dilute acids, lemon-juice. Demulcents: milk and oil, flour and water, etc. |
| Alkaloids. | Finely-divided animal charcoal, tannic acid, coffee. |
| Poisonous vapors and gases:—<br>Ammonia,<br>Bromine,<br>Chlorine,<br>Iodine,<br>Carbonic oxide (CO),<br>Carbon dioxide ($CO_2$),<br>Charcoal fumes,<br>Coal-gas,<br>Fire damp,<br>Choke-damp,<br>Marsh-gas,<br>Hydrogen sulphide. | Fresh air, oxygen inhalations, artificial respiration. Intra-venous injections of ammonia. Transfusion of blood. |

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* For those who wish further information concerning poisons and their antidotes, we would highly recommend Dr. Murrell's little book, "What to Do in Case of Poisoning."

| *Poisons.* | *Antidotes.* |
|---|---|
| Aconite. | Diffusible stimulants, tannic acid, coffee or tea infusion, alcohol, ammonia. Hypodermic injections of digitalis, strophanthus, or amyl nitrite. Hot pack. Faradization. |
| Alcohol. | Coffee, ammonium acetate, ammonia, stimulating enemata, catheterization. |
| Anæsthetics. | Artificial respiration, inhalation of ammonia or amyl nitrite, faradization, inversion of the body. |
| Antimony. | Tannic acid, albumen, milk, and demulcents, with hypodermic injections of morphine and atropine. |
| Apomorphine. | Chloroform mixture; digitalis hypodermically. |
| Arsenic. | Freshly-precipitated hydrated sesquioxide of iron (℥ss to each grain of poison), or hydrated oxide of iron with magnesia, or dialyzed iron. Animal charcoal, magnesia, with opium to relieve pain and vomiting or diarrhœa. Demulcents. |
| Atropine (Belladonna). | Morphine, cautiously given; fixed alkalies. Caffeine or fresh infusion of coffee or tea, artificial respiration. Physostigmine, muscarine, and pilocarpine are physiological antidotes. |
| Belladonna. | (See atropine.) |
| Brucine. | Same as for strychnine. |
| Calabar bean (Physostigmine). | Stimulants, fixed alkalies, atropine hypodermically, artificial respiration. |
| Cannabis Indica. | Atropine. |
| Cantharides. | Opium, demulcent drinks, saline cathartics. Avoid oils and fats. |
| Carbolic acid. | Soluble sulphates, saccharated lime, stimulants and anodynes. |
| Chloral. | Hot infusion of tea or coffee, strychnine hypodermically, warmth and exercise. |
| Cinchona (Quinine, Cinchonine, Quinidine, etc.). | Tannic-acid and astringent infusions: iodine forms insoluble compounds with the alkaloids. Morphine and atropine hypodermically. |
| Codeine. | (See opium.) |
| Colchicum. | Opium, stimulants, astringents. |
| Conium. | Alkalies, astringents, strychnine hypodermically. |
| Copper. | Morphine, albumen, demulcents. |
| Corrosive sublimate. | Albumen, atropine, and morphine. |
| Croton-oil. | Opium, stimulants, demulcents. |
| Curare. | Strychnine and atropine, oxygen inhalations, artificial respiration. |
| Cyanide of potassium (Hydrocyanic acid). | Artificial respiration, ammonia inhalations. Cold affusions to the spine, transfusion of blood. Ether hypodermically. |

| *Poisons.* | *Antidotes.* |
|---|---|
| Digitalis. | Opium, nitro-glycerin solution. |
| Gelsemium. | Atropine, strophanthus, hot alcoholic stimulants, hypodermic injections of ether. |
| Hyoscyamus. | Same as for atropine. |
| Lead salts. | Magnesium sulphate, opium, potassium iodide. Baths. |
| Lobelia. | Morphine, strychnine, strophanthus, stimulants. |
| Mercurials. | (See also corrosive sublimate.) Albumen, demulcent drinks, opium or belladonna. |
| Morphine. | (See opium.) |
| Muscarin,<br>Mushrooms. | Stimulants and cathartic agents; atropine hypodermically, with morphine, if needed. |
| Nitrites:—<br>Amyl,<br>Sodium,<br>Nitro-glycerin. | Stimulants, digitalis, atropine, artificial respiration, hot and cold douches, ergot. |
| Oil of bitter almonds. | (See cyanide of potassium.) |
| Opium<br>(Morphine,<br>Codeine). | Emetics or stomach-pump, coffee, exercise, friction or flagellation, caffeine by the rectum, atropine hypodermically, faradization, artificial respiration, warmth. |
| Phosphorus. | Old oil of turpentine; sulphate of copper. Avoid oils and fats. Transfusion of blood. |
| Picrotoxin. | Chloral, bromides, morphine. |
| Pilocarpine. | Atropine. |
| Savin. | Soluble sulphates, demulcents, anodynes. |
| Silver<br>(Lunar caustic). | Table-salt, chlorides, demulcents, potassium iodide. |
| Snake venom. | Ligature of limb, with application of cupping-glass or caustic alkali. Ammonia inhalation, stimulants. Artificial respiration. Heat to surface. |
| Stramonium. | (See atropine.) |
| Strychnine. | Chloral, potassium bromide, chloroform by inhalation, alkalies, tannin. |
| Tobacco. | Strophanthus, hot applications, and cardiac stimulants; strychnine hypodermically. |
| Turpentine, oil of. | Magnesium sulphate, demulcents, opium. |
| Veratrine. | Diffusible stimulants, caffeine; rest in recumbent posture. |
| Zinc salts. | Sodium carbonate and demulcents; anodynes if needed. |

# GENERAL THERAPEUTICS AND CLASSIFICATION OF REMEDIES.

**Classification** has been found as difficult in Materia Medica as in every other branch of natural science. It is impossible to mark out, with exactitude, definite limits to the action of drugs. If, from one point of view, a medicine be described as diuretic, we are sometimes obliged to admit that it might be no less properly placed among the cathartics or diaphoretics. When we seek to understand the mechanism of its action and its influence upon the composition of the urine, we must study its effect upon the central nervous system, the cardiac nerves and ganglia, the heart-muscle, and the muscular coat of the arterial system. The organs concerned in sanguification may likewise be affected, and this result is evidenced by the changed proportion of the urinary constituents. If a drug specially impresses the chief nerve-centres, its range of influence must extend more or less powerfully and directly to every important organ. It need not, therefore, seem strange that no classification of remedies has permanently endured. In describing the properties and applications of drugs, the alphabetical arrangement is adopted as the most simple and convenient. Nevertheless, as our main object is to obtain a practical command of our therapeutical resources, it will always be useful to associate our remedies in classes, so that, in the absence or failure of any one, a substitute or a successor shall readily suggest itself to the mind. For these reasons the author deems it useful to precede the discussion of individual drugs by a brief summary of the salient characteristics of the various groups into which they may be arranged.

However imperfect a system of classification may be, it, nevertheless, serves to accomplish this useful object. The mental association of drugs which possess, in the main, similar properties renders the knowledge of the therapeutist more available, and assists him when it becomes necessary to alternate or combine his remedies. At the same time the individual or divergent action of medical substances is likewise emphasized, and this is a point of great importance in the judicious selection of agents. Though the combination of many remedies in one formula is to be deprecated, yet it is often highly advantageous to supplement the deficient action of one drug by the addition of one or more endowed with different but desirable virtues. The existence of chemical incompatibilities, however, should never be overlooked in forming such combinations, though it must be acknowledged that chemical and therapeutical incompatibilities are not always identical. Remedies may be divided into classes (after Garrod):—

## *Classification of Medicines.*

- Internal Remedies.
  - Medicines Affecting Nutrition
    - Blood tonics (hæmatinics).
    - Alkalies.
    - Acids.
    - Astringents.
    - Refrigerants.
    - Antipyretics.
    - Alteratives.
  - Medicines Acting through the Nervous System.
    - The Brain.
      - Exhilarants.
      - Hypnotics and Anodynes.
      - Anæsthetics.
    - Spinal Cord.
      - Stimulants.
      - Sedatives.
    - Nerve-Centres and Ganglionic System.
      - Antispasmodics.
      - Tonics and Antiperiodics.
    - Heart and Circulatory System.
      - Vascular stimulants.
      - Vascular sedatives.
    - Special Organs.
      - Alimentary Canal.
        - Sialagogues.
        - Antisialics.
        - Emetics.
        - Anti-Emetics.
        - Purgatives.
        - Anthelmintics.
        - Stomachics.
      - The Liver.
        - Hepatic stimulants.
        - Hepatic depressants.
      - Respiratory Apparatus.
        - Expectorants (pulm. stim.).
        - Pulmonary sedatives.
      - Cutaneous System.
        - Diaphoretics.
      - Urinary System.
        - Diuretics.
        - Lithontriptics.
      - Generative System.
        - Embolics.
        - Emmenagogues.
        - Ecbolics.
        - Aphrodisiacs,
        - Anaphrodisiacs.
      - The Eyes.
        - Mydriatics.
        - Myotics.
- External Remedies.
  - Irritants.
    - Rubefacients.
    - Epispastics or blistering agents.
    - Pustulants.
    - Escharotics and Caustics.
  - Sedatives.
  - Demulcents.
  - Emollients.
  - Astringents and Styptics.
  - Antiparasitics.
- Chemical Agents.
  - Antiseptics and Disinfectants.

**Hæmatinics** are remedies which exert a direct influence upon the composition of the blood. Useless, or even deleterious in health, such a drug tends to improve, in certain diseased states, the quality of the blood, and, consequently, the nutrition of the entire organism. Destruction of its corpuscular elements and drain of its albumin indicate that the nutrient fluid-tissue urgently requires increased and appropriate pabulum. This supply is, in health, derived from the food; but, in pathological conditions, must be administered in a more concentrated and less complex form. Remedies belonging to this class are, or contain, normal constituents of the body, and are necessary to the maintenance of structure and the performance of function.

Hæmatinics are preparations of iron, preparations of manganese, codliver-oil, other animal oils, and vegetable oils.

**Alkalies.**—When alkalies, in concentrated form, are brought into contact with animal tissues, they enter into chemical combination with the oxygen present, and thus give rise to an active, destructive inflammation. Alkalies are, likewise, solvents of albumin. These physical and chemical properties render the caustic alkalies useful in producing powerful counter-irritation. Their escharotic effects have been made use of in chronic synovitis, myelitis, and meningitis, and in the destruction of morbid tissue, whether of neoplastic or inflammatory origin. Potassium, in large doses, depresses or paralyzes the activity of nervous and muscular tissue.

The alkalies combine with and neutralize acids. Therefore, they are useful in overcoming hyperacidity of the stomach, whether due to the excessive production of hydrochloric acid or to fermentative changes, with the production of fatty acids. They promote the secretion of acid and restrain that of alkaline fluids. Hence, when administered immediately before a meal, an alkali excites a flow of gastric juice, and, in this way, promotes digestion and is serviceable in dyspepsia. On the other hand, given immediately after a meal, such a remedy, by neutralizing the gastric juice, embarrasses digestion, and fermentation proceeds unchecked. It can readily be understood, therefore, how the prolonged use of alkalies in dyspepsia at length disorders appetite and aggravates the condition for which they were originally prescribed. A dilute alkaline solution checks the discharge of acute eczema, which possesses the same reaction; it allays the itching and smarting of this disease, or the burning pain of superficial burns and scalds. Paræsthesia, whether dependent upon constitutional disorder or excited by local causes, is often amenable to the influence of an alkaline lotion. The same preparation is beneficial by neutralizing acid secretions from the bowel, vagina, or the skin, and obviating their effects.

A diminished alkalinity of the blood in rheumatism and gout is caused by the presence, respectively, of lactic or uric acid in excessive quantity. The alkalies are advantageous in these diseases, combining with the acid and facilitating its elimination. The same result takes place in the urine. The reaction of that fluid being rendered alkaline, uric acid is dissolved or forms soluble combinations, irritation of the urinary tract is quieted, and the precipitation of the uric acid in the kidney or bladder is prevented. Alkalies are useful when a uric-acid calculus is present. They may be able to dissolve a small and soft stone. At all events, they prevent further deposit and relieve the local irritation which the foreign body has occasioned.

Prolonged administration of an alkaline remedy may be injurious and give rise to emaciation and debility from the accelerated disintegration of nitrogenous tissue. These remedies aid in the resolution of inflammatory exudations. Finally, an alkali acts as a chemical antidote in case of poisoning by an acid.

Alkaline remedies consist of: solution of potassa, potassium carbonate and bicarbonate; solution of soda, sodium carbonate and bicarbonate; lithium carbonate; calcined magnesia and magnesium carbonate; lime-water, precipitated calcium carbonate and prepared chalk. The combinations of potassium, sodium, and lithium with the vegetable acids do not act as alkalies in the stomach, but, being converted into carbonates in the blood, they alkalinize the urine as they escape from the system.

**Acids.**—When given after meals, these supply the acid medium in which pepsin is efficient. They, therefore, improve the appetite and digestion, and are useful in digestive disorders. They promote secretion, allay thirst and nausea. Administered before a meal, they check hyperacidity of the stomach. The mineral acids possess astringent properities, and are of service in lessening hæmorrhages, morbid secretions, and discharges. They are, likewise, antiseptic, disinfect the alimentary canal, and restrain deleterious fermentation of its contents. In a concentrated form they act as escharotics,

The properties of vegetable acids are similar to, but generally feebler, than those of the mineral acids. They are, however, with the exception of tannic acid, devoid of astringency. On the other hand, they exert a more decided influence upon the eliminative organs, and stimulate the secretions of the skin, kidneys and bowels. In saturated solution, the vegetable acids are irritant, or even caustic. They have antiseptic virtues and assist digestion.

Both mineral and vegetable acids are beneficial in certain morbid states of the blood, as purpura or scurvy, and in fevers. The principal acids used in medicine are : acetic acid, benzoic acid, citric acid, lactic acid, tartaric acid, hydrochloric acid, nitrohydrochloric acid, nitric acid, phosporic acid, and sulphuric acid.

**Astringents** coagulate albumin and excite contraction of unstriped muscular tissue. In strong solution, most of these substances exert a caustic action. They are useful in overcoming a relaxed or debilitated condition of muscular fibre, and, by contracting arterioles and capillaries and the gland-ducts, they repress secretion. They likewise restrain peristalsis. Astringents are of avail in the treatment of hæmorrhage and hypersecretion.

Agents of this class are derived both from the inorganic and organic kingdoms. The action of the vegetable astringents chiefly depends upon the presence of tannic acid or some of its modifications or allied forms. The principal members of this group of remedies are tannic and gallic acids, kino, catechu, krameria, geranium, and hamamelis. The mineral astringents comprise the salts of bismuth, zinc, alum, copper, lead, and silver. The salts of iron with mineral acids also exert a similar effect.

**Refrigerant** remedies are those which allay thirst produced by fever. The local action of water, or pieces of ice allowed to melt upon the tongue, affords temporary relief. Glycerin, topically applied, is of service in moistening the tongue. The vegetable and mineral acids, in weak solution, excite the secretion of saliva.

**Antipyretics** reduce abnormal temperature, either by limiting the generation of heat or by favoring its loss through radiation, conduction, and the work of evaporating the perspiration. Agents which diminish oxidation, depress the circulation, or which, presumably, exert a specific corroborant influence upon the heat-centre, lower temperature by lessening heat production. Those which dilate the cutaneous vascular system favor the loss of heat. Immersion in water below the temperature of the body is a highly valuable method of decreasing fever-heat.

Drugs which limit the production of heat by diminishing tissue change are: antipyrin, benzoic acid, camphor, carbolic acid, cinchonine, eucalyptol, phenacetine, quinine, resorcin, salicylic acid and its combinations, salicin, thymol. Those which lower temperature by acting on the circulation are: aconite, antimony, digitalis, gelsemium, thallin. Drugs which increase radiation are: acetanilid, alcohol, antipyrin, nitrous ether, thallin. Those which dissipate heat in evaporating the perspiration are: antimony, nitrous ether, opium and ipecacuanha, pilocarpus.

**Alteratives.**—This term has been bestowed upon a class of remedies which possess the power of modifying deranged nutritive processes. Given persistently, in small doses, alteratives improve the quality of the blood and often increase the number of its red corpuscles. Appetite, digestion, secretion, absorption, and elimination are promoted. The circulation and respiration are invigorated, the nutrition and functional activity of the nervous centres improved.

Alteratives counteract the effects of various forms of toxæmia, as that of chronic malaria, syphilis, scrofula, tuberculosis, carcinoma, and of slow mineral poisoning. They promote the absorption of inflammatory exudations.

The principal agents of this class are: gold and sodium chloride, preparations of arsenic, preparations of mercury, preparations of iodine, iodoform, iodol, potassium chlorate, antimony, mezereum, sulphur, sulphides, colchicum, guaiacum, sanguinaria, xanthoxylum, calcium chloride, stillingia, sarsaparilla, codliver-oil, and phosphorus.

**Exhilarants** determine an active cerebral circulation and stimulate the functions of cerebral centres; but if administered for too long a time or in excessive quantities, a depressing effect is produced. The effect upon the higher is reflected to the lower centres, the heart strengthened, the respiration deepened, and muscular vigor promoted. Substances belonging to this class support the system under prolonged and unusual strain, and are often useful in the treatment of mental alienation. Among exhilarants may be ranked the preparations of belladonna, hyoscyamus and stramonium, coca, tea, coffee, ether, and alcohol.

**Hypnotics and Anodynes.**—Hypnotics cause sleep, anodynes allay pain. Sound sleep obliterates the perception of pain; the relief of pain permits sleep. A close relationship exists, therefore, between these varieties. A hypnotic will often abolish pain, while an anodyne will frequently overcome wakefulness. In some substances, however, the hypnotic, and in others the anodyne, influence is most conspicuous. When sleeplessness depends upon anxiety, mental excitement, or prolonged intellectual effort, the treatment differs from that to be adopted when insomnia is due to pain. Hypnotics act chiefly by influencing the circulation through the brain, anodynes by their effect upon sensory centres.

The chief remedies belonging to this class are the following: opium, chloral hydrate, chloralamid; potassium, sodium, or ammonium bromide; hypnal, paraldehyde, sulphonal, trional, somnal, and urethan.

**Anæsthetics.**—Agents of this class abolish consciousness and sensation by inhibiting the functions of the higher cerebral centres. When their influence is continued, the sensory and motor centres of the spinal cord and of the medulla oblongata are in turn affected. The first result of their inhalation is a stage of intellectual, emotional, and motorial excitement. This is succeeded by a stage of narcosis. Anæsthetics destroy life by paralysis of the centres situated in the medulla oblongata. They are employed for the purpose of relaxing spasm and producing a condition of unconsciousness, during which surgical operations may be painlessly performed.

The chief members of this group are: ether, chloroform, ethyl bromide, and nitrous oxide.

**Spinal Stimulants.**—Agents belonging to this class, when given in medicinal doses, exalt the functions of the cord, invigorate the action of the heart and lungs, promote secretion and nutrition.

These remedies are useful in atonic dyspepsia, atony of the bowel or bladder, cardiac weakness, emphysema, neuralgia, spinal neurasthenia, paralysis, and phthisis.

The principal members of this group are: nux vomica and its related species, ignatia and hoang-nan, alcohol and camphor in small doses.

**Spinal Sedatives.**—These are substances which have the property of reducing the functions of the spinal cord. They may act directly upon the nerve-cells, or produce their effect by an influence on the circulation through the cord. Excessive doses cause paralysis. Spinal sedatives are valuable in conditions of irritation or congestive excitement of the cord. The chief remedies belonging to the group are: potassium bromide, sodium bromide, lobelia, gelsemium, conium, hydrocyanic acid, potassium nitrate, and physostigmine salicylate.

**Antispasmodics.**—Antispasmodic drugs allay irregular action of the voluntary or involuntary muscles by a calmative influence upon nerve-centres. They are of use in many disorders characterized by nervous excitement and muscular spasm, such as hysteria, colic, asthma, and intestinal colic. The principal antispasmodic remedies are: ammoniac, valerian, asafœtida, camphor, musk, castor, and ether.

**Tonics.**—Tonics improve appetite, digestion, assimilation, and secretion, strengthen the circulatory apparatus, improve the composition of the blood, invigorate the muscular system, and promote the nutrition of nerve-centres and fibres. The most powerful members of this class possess antiperiodic virtues. Tonics are useful in the treatment of digestive disorders, in depressed conditions of the nervous system and nutrition in general, and in diseases characterized by periodicity. The former variety includes: gentian, calumba, chirata, serpentaria, and eucalyptus. The preparations of iron and manganese act as tonics when the quality of the blood is impaired. Certain mineral salts, as zinc oxide, silver oxide, and zinc sulphate, exert a similar influence in nervous affections, as chorea and epilepsy.

**Vascular Stimulants.**—Members of this class strengthen the action of the heart and blood-vessels. They are, therefore, advantageously employed in weakened conditions of the central organ of the circulation, in transudation due to blood-stasis, and in hæmorrhage. Chief among vascular stimulants are: alcohol, preparations of ammonium, caffeine, convallaria, digitalis, strophanthus, and scoparius.

**Vascular Sedatives.**—These remedies render the heart's action more slow and less forcible. They moderate cardiac excitement, and are of service in febrile and inflammatory affections of a sthenic type. Examples of this class are: aconite, veratrum viride, gelsemium, antimony, muscarine, pilocarpine, hydrocyanic acid.

**Sialagogues.**—Sialagogues excite the secretion of saliva, either by an irritant local effect, with a reflex stimulation of the salivary glands, or by a specific influence upon the glands during their elimination. Examples of the former variety are: capsicum, mustard, ginger, pellitory, and mezereon; of the latter: preparations of iodine and mercury, pilocarpus, muscarine, and physostigma.

**Antisialics** check salivary secretion. This is the action of belladonna, opium and potassium chlorate.

**Emetics.**—Emetics cause vomiting, either by irritating the terminal filaments of the gastric nerves or by exciting the nervous centre which presides over the act of emesis. Remedies which act by direct irritation are: alum, mustard, copper sulphate, zinc sulphate, and mercuric subsulphate. General or systemic emetics are: apomorphine, ipecacuanha, and tartar emetic.

**Anti-emetics** allay irritability of the gastric nerves or the vomiting centre. Bismuth, cerium oxalate, creasote, carbolic acid, chloroform, ether, calomel, and silver nitrate soothe gastric irritation. Opium, hydrocyanic acid, bromides, and chloral hydrate quiet the excitement of the nerve-centre.

**Purgatives** produce evacuation of the contents of the intestinal canal by increasing secretion or transudation along the tract and by exciting peristaltic movements. According to the intensity of their action, purgatives or cathartics are subdivided into several varieties: (1) Laxatives cause slight increase of secretion and peristalsis, resulting in softened stools. Among laxatives are ranked manna, sulphur, figs, prunes, olive-oil, cascara sagrada, hyoscyamus, soap, etc. (2) Simple purgatives, or purgatives proper, are more decidedly stimulant, and occasion semi-liquid motions. Belonging to this group are: senna, aloes, rhubarb, castor-oil and calomel. (3) Drastic cathartics are strongly irritant to the intestinal mucous membrane, and occasion transudation from its vessels and almost fluid stools. The action of drastics is accompanied by considerable griping pain. Examples of drastics are: jalap, colocynth, gamboge, scammony, elaterium, podophyllum, and croton-oil. Excessive doses of simple purgatives have a very similar effect. (4) Hydragogue purgatives remove abundant serum from the intestinal blood-vessels and produce large, watery motions. An analogous action is exerted by various salts of the alkalies and alkaline earths. Large doses of the drastic cathartics have the effect of hydragogues. The principal saline purgatives are the sodium sulphate, magnesium sulphate, magnesium citrate, potassium tartrate and bitartrate, potassium and sodium tartrate. (5) Cholagogue purgatives stimulate, either directly or indirectly, the liver, cause an increased flow of bile, quicken the peristaltic movements, and produce greenish, liquid evacuations. Among the cholagogues are included mercury, aloes, euonymin, iridin, rhubarb, leptandra, and podophyllum.

**Anthelmintics** cause destruction or expulsion of intestinal worms. Those agents which destroy are termed vermicides; those which expel are known as vermifuge remedies. Tape-worms are killed or removed by means of aspidium, kamala, kousso, pomegranate or pelletierine, pumpkin-seed, turpentine, and chloroform. Remedies which act against round-worms are: santonin, spigelia, chenopodium, and azedarach. Seat-worms are destroyed by enemata of table salt, tannic acid, quassia, eucalyptol, etc.

**Stomachics.**—Stomachics stimulate the gastric mucous membrane, increase appetite, promote the secretion of gastric juice, and assist digestion. They restrain abnormal fermentation and dispel accumulation of flatus. Among stomachics are: capsicum, piper, cardamom, cloves, mustard, ginger, horse-radish, calumba, chirata, nux vomica, etc.

**Hepatic Stimulants.**—These are medicines which excite the liver to increased functional activity. They occasion an augmented formation of bile, and thus promote the normal elaboration of nitrogenous aliment. By many agents of this class the newly-formed bile is rapidly swept along the intestine by a cathartic action and its re-absorption prevented. The conversion of nitrogenous waste into its soluble end-product, urea, is thus favored by these remedies, some of which are known to cause increased elimination of urea. Others, again, stimulate the glycogenic function of the liver.

The principal substances which increase the production of bile are: nitro-hydrochloric acid, ipecacuanha, sodium phosphate, mercuric chloride, aloes, podophyllin, rhubarb, colocynth, euonymin, iridin, etc. The quantity of urea is increased by ammonium chloride, arsenic, antimony, phosphorus, and iron. The glycogenic function is stimulated by nitro-hydrochloric acid, amyl nitrite, and sodium bicarbonate.

**Hepatic Depressants.**—Agents belonging to this class reduce functional activity of the liver, diminishing the formation of bile, urea, and glycogen. Those which lessen the secretion of bile are: opium, lead acetate, alcohol, and quinine. The amount of urea is decreased by opium, alcohol, qüinine, and colchicum. Glycogen is diminished by opium, phosphorus, arsenic, and antimony.

**Expectorants.**—Expectorant remedies modify the character of the bronchial secretions and facilitate their expulsion. Small or nauseating doses of emetic substances increase and liquefy the secretions of the mucous membrane. Larger doses, by causing vomiting, mechanically aid the expulsion of mucus from the air-passages. The term "stimulating expectorants" is given to a group of drugs eliminated by the bronchial mucous membrane which they stimulate, and the secretion of which they at the same time alter and improve. Certain substances, when dissolved in the mouth, aid expectoration by a stimulating influence upon the cilia of the trachea and bronchi. These are called ciliary excitants. The nauseating expectorants are: antimony, ipecacuanha, apomorphine, lobelia, pilocarpus, etc. Among the stimulating expectorants are: ammonium chloride, balsams of Peru and Tolu, senega, squill, sulphur, and turpentine. Ciliary excitants are: ammonium chloride, potassium and sodium chlorate, gum acacia, etc.

**Pulmonary sedatives** relieve cough by allaying irritability of the respiratory centre or the terminal fibres of the nerves distributed to the bronchi and lungs. Examples of this class are: opium, belladonna, stramonium, hyoscyamus, hydrocyanic acid, etc.

**Diaphoretics** increase perspiration by stimulating the sudoriparous glands in the course of their removal, as sulphur, guaiacum, sarsaparilla, serpentaria, mezereon, and camphor. Other agents produce the same effect by causing relaxation of the cutaneous capillaries. In this subdivision are found the nauseants and emetics, as tartar emetic, ipecacuanha, lobelia, and Dover's powder, as well as opium, ether, and alcohol. A third group of remedies excites diaphoresis by an influence upon the sweat-centres, as pilocarpus, veratrum viride, and salts of potassium.

**Diuretics.**—The quantity of urine excreted is increased by remedies which raise general or local arterial tension, and by those which stimulate the secreting cells of the kidney. The free ingestion of water assists the action of diuretic drugs, and is mechanically serviceable by irrigating the renal tubules. Among the stimulant diuretics are found cantharides, copaiba, cubeb, turpentine, colchicum, squill, broom, juniper, potassium nitrate, and calomel. The principal agents which act by elevating blood-pressure are: digitalis, belladonna, nux vomica, and alcohol.

**Lithontriptics.**—This name has been given to a class of remedies which increase the flow of urine, and at the same time, by modifying its chemical reaction, dissolve and prevent the deposition in the urinary passages of uric, phosphoric, or oxalic acid, or insoluble salts of those acids. If precipitation has taken place, they are given with a view to dissolve or remove gravel or calculi. Potassium carbonate, bicarbonate and citrate, lithium carbonate and citrate, are the principal solvents for uric acid. The agents which are given for the purpose of acting upon phosphoric calculi are: benzoic acid, ammonia benzoate, and diluted nitric acid.

**Ecbolics.**—These remedies, also known as oxytocics, stimulate the pregnant womb to contraction. They may thus lead to abortion, if prematurely given, but, administered during labor, are often of valuable assistance by invigorating the organ. It is surmised that ecbolics may act either by causing direct irritation of the muscular structure of the womb, or exciting contraction through an influence upon the uterine centre in the cord. The principal ecbolics are: ergot, cotton-root bark, ustilago, savin, rue, and cimicifuga.

**Emmenagogues.**—Emmenagogues excite the menstrual flux either by a direct stimulant effect upon the uterus, or indirectly by improving the quality of the blood and nutrition in general. Small doses of **ecbolic** remedies are usually emmenagogue. Direct emmenagogues are: ergot, savin, cantharis, rue, myrrh, etc. Indirect emmenagogues are: preparations of iron and manganese, nux vomica, codliver-oil, etc.

**Aphrodisiacs** excite the genital functions. This object they accomplish by stimulation, either direct or reflex, of the centres which govern the genital organs. Whatever promotes nutrition tends indirectly to invigorate the sexual apparatus. The chief aphrodisiac agents are: cantharis, phosphorus, small doses of opium, alcohol, camphor, and damiana.

**Anaphrodisiacs** diminish sexual desire and power. They allay excitability of the genital centres and diminish irritation or hyperæmia of the generative organs. Among anaphrodisiacs are included potassium, sodium and ammonium bromide, potassium iodide, large doses of camphor or opium, tobacco, gelsemium, etc. Whatever depresses general systemic vigor has likewise an indirect anaphrodisiac effect.

**Mydriatics** produce dilatation of the pupil by stimulation of the end-organs of the sympathetic, with contraction of the radiating fibres of the iris as a result, and by paralysis of the third nerve, causing relaxation of the circular fibres. The principal mydriatics are: atropine, homatropine, daturine, duboisine, and hyoscyamine.

**Myotics** cause the pupil to contract by stimulating the circular fibres of the iris. Eserine, or physostigmine, acts when locally applied, and is used by ophthalmologists for this purpose. Other drugs which contract the pupil, though not administered for that purpose, are opium, pilocarpus, and muscarine.

**Irritants** are applied to the skin in order to produce nervous and vascular reaction. According to the degree of their action, they are classed as **rubefacients,** or those which simply redden the surface; **epispastics** or **vesicants,** those which occasion blisters; and **pustulants,** which excite sufficient inflammation to form pus. The rubefacients most in use are mustard, capsicum, arnica, turpentine, chloroform, ether, and iodine. Among vesicants are ranked cantharides, euphorbium, mezereon, and iodine. The principal pustulants are tartar emetic, croton-oil, and silver nitrate. The prolonged application of a rubefacient often gives rise to a blister.

**Escharotics** or **caustics** destroy tissues and lead to the formation of a slough. The principal escharotics are: carbolic acid, glacial acetic acid, chromic acid, strong mineral acids, caustic potash, and caustic soda.

**Local sedatives** diminish nervous and vascular excitement in the part to which they are applied. They consequently relieve local inflammation and pain. Among agents of this group are bismuth, acetate of lead, aconite, cocaine, opium, belladonna, etc.

**Demulcents** are bland substances used to protect mechanically the gastro-intestinal tube from contact with irritant poisons, to allay inflammation of the same canal, of the respiratory or genito-urinary passages. Many of them possess some nutritive value. This class embraces acacia, flaxseed, elm, marshmallow, Iceland and Irish moss, starch, gelatin, olive-oil, etc.

**Emollients** are applied to the external surface. They resemble demulcents in being of a bland, soothing character, protect the surface from friction and from air, relieve tension and diminish pain. Among emollient substances are: lard, olive-oil, spermaceti, glycerin, starch, cacao-butter, etc.

**Local Astringents and Styptics.**—The astringents and acids, which are useful in checking hæmorrhages and morbid discharges when administered internally, have the same effect when locally applied.

**Antiparasitics, Disinfectants, Antiseptics.**—The term **antiparasitic,** or **parasiticide,** is generally restricted to agents which have the power of destroying the animal and vegetable parasites which may infest the exterior of the body. **Antiseptics** act upon pathogenetic micro-organisms, prevent their growth and multiplication, and neutralize or destroy the toxic products of these micro-organisms. **Antiparasitics** are germicidal. **Antiseptics,** though not necessarily germicidal, protect the system against infection. The principal antiparasitic remedies are: sulphur, iodine, mercury, carbolic acid, and boric acid. The most valuable antiseptics are: mercuric chloride, carbolic acid, creasote, salicylic acid, chlorine, naphthol, aristol, quinine, thymol, sulphurous acid, iodol, iodoform, resorcin, etc. **Disinfectants** are used for the purpose of destroying the organic germs of disease, as they may exist in the atmosphere, clothing, water, pathological discharges, etc. Substances which accomplish this purpose are: sulphurous-acid gas, chlorine, bromine, zinc chloride, mercuric chloride, etc. Heat is also disinfectant.

**Dosage.**—By the dosage of a remedy is meant the amount or quantity of the agent required to produce a definite therapeutic result. Naturally a considerable margin exists, owing to different degrees of vigor in patients, and to the amount of impression we desire to make upon the bodily functions. It is evident, then, that, even among patients of the same age, some will require larger doses than others in order to produce a particular effect. Thus arises the distinction between the **minimum** and **maximum** doses, the former being the smallest dose capable of physiological or therapeutical effect, the latter being the largest dose which it is considered safe to give. The **toxic** dose is larger than the maximum dose, and, when administered, rapidly develops the physiological action of the drug in a high degree, giving rise to what are known collectively as symptoms of poisonous action of the remedy. **Broken** or **fractional** doses are merely doses much smaller than those usually given, and intended to develop the physiological effects by degrees, being the reverse of toxic doses in the sense that they singly produce no marked disturbance, and are within perfectly safe limits. In the following pages reference may be found to a **full** or **single dose,** the **interrupted dose,** and the **continued dose.** The **full dose** is the maximum amount which the patient will require to produce the physiological action of the remedy, and it is usually not intended to be repeated. For instance, an ounce of magnesium sulphate, or several cathartic pills, may be ordered to accomplish a certain therapeutic result, and, this being obtained, there is no need to give any more. Where the symptoms frequently recur, as where purgative remedies are required in chronic constipation, or amyl nitrite for angina pectoris, it becomes necessary to repeat the administration of the remedy from time to time, the system having opportunity to recover fully from the effects of one dose before another is administered. We have then what is called the **interrupted dose**, which is generally smaller than the full dose, although exceptionally it occurs that by the frequent repetition of a remedy the system becomes accustomed to it, and larger doses are required to produce the same effect, or it progressively fails in therapeutic value. The **continued dose** is where each succeeding dose is given before the effects of the preceding have passed away, so that when the intervals are short a **cumulative action** of the remedy is seen. The latter obviously depends upon the rapidity of rate of elimination of the agent; some drugs, like alcohol or ether, are excreted very quickly, and exert a cumulative action only when the intervals are very short; others, like digitalis and the mineral poisons, are excreted slowly, and may show a cumulative effect after awhile, even when only one or two doses are given daily.

**Systemic, Specific and Analeptic Remedies.**—A **systemic** remedy is one which is not designed to affect the organs by which it enters the circulation, nor those by which it is finally excreted; it is given with a view of bringing about some change in the general solids or fluids of the body, so as to affect nutrition, and, as a rule, does this through some effect upon the nervous system. Remedies designed to affect special organs, such as the liver, kidneys, heart, genito-urinary tract, or alimentary canal, are local or organic remedies. Remedies are also divided into inorganic and organic, in relation to their nature and origin, as they belong to the mineral kingdom or to the animal or vegetable kingdom. A **specific** remedy is one having the power to stop the course of a particular disease and act as an antidote to its effects. There are no "sure cures" in medicine, and no true specifics. Still, the manifestations of malaria are so uniformly controlled by cinchona, syphilis by mercury, rheumatism by salicylic acid, and gout by colchicum, that these remedies are considered as approaching the character of specifics, although they sometimes fail, and often must be combined with other remedies in order to produce the best results. **Analeptic** remedies are those which build up the system; they are tonics and restoratives; they stimulate the nutritive functions, and some of them, such as codliver-oil, act as food. A remedy is said technically to be indicated when the symptoms show that the function of some part of the body is disordered; and our knowledge of the physiological action and clinical effects of the remedy indicates to us the probability that its administration would produce a favorable result; thus, an emetic would be indicated in narcotic poisoning or in croup, a purgative would be indicated in fæcal impaction of the bowels or in cerebral congestion; the sponge-bath and antipyretics are indicated in fever. It is not meant that there is any mysterious relation existing between certain diseases and particular remedies in the sense that nature is crying out for a certain drug, and that no other would be serviceable, or that the patient would necessarily die if the medical attendant failed to discern the indication or to decipher the cabalistic inscription by which nature tests his skill. Diseases arise from causes; the object of treatment is (1) to remove the cause of disorder, if possible, and if not (2) to obviate its effects by removal of the patient to more sanitary surroundings, or place him in improved physiological condition, and better able to resist the onward course of the disease; and (3) to make the patient comfortable and do what is possible to hasten recovery. This is rational medicine; it is also scientific medicine because based upon exact knowledge of the effects of drugs and other remedial agents. From various sources an immense fund of information has been collected and reduced to laws or rules, the application of which, to individual cases of disease, constitutes the art of medicine, or practical therapeutics.

# PART II.

## PHARMACEUTICAL THERAPEUTIC AGENTS, OR DRUGS.

In this section will be considered, systematically and in alphabetical order, the remedial agents or drugs in present use in the treatment of disease. All of the drugs and preparations made official by the United States Pharmacopœia receive notice and consideration in proportion to their importance. Some of the most valuable of the new remedies which are coming largely into use by the profession have also been introduced, these being distinguished from the official agents by the absence after them of the letters U. S. P.

Each drug will be considered individually and from three different points of view: (1) the botanical or chemical definition and physical characters of the remedy, with the strength and dosage of its various preparations; (2) its physiological actions, including toxicology and antidotes, with special effects, if any, upon individual organs and tissues; and (3) the therapeutical indications, with illustrative formulæ and suggestions as to eligible forms of administration, or cautions concerning its use. This arrangement is the one which has been found by experience to be the most convenient to facilitate reference and study.

**ABIES BALSAMEA.** See Terebinthina Canadensis.

**ABIES CANADENSIS.** See Pix Canadensis.

**ABIES EXCELSA.** See Pix Burgundica.

**ABRUS.**—**Jequirity,** or **Wild Liquorice,** the seeds of Abrus precatorius. (Leguminosæ.)

**Pharmacology.**—A small plant or shrub, a native of India, but naturalized elsewhere in the tropics. The seeds, or beans, are small, nearly round, of a bright-red color, with a black spot at the hilum. They contain mucilage, abric acid, and a peculiar ferment to which the activity of the infusion appears to be principally due. They do not contain any alkaloid. A globulin and an albumose have also been found in jequirity. These bodies, of similar chemical composition, are both toxic, and their systemic effects have been likened to those produced by the venom of the snake. The temperature is lowered and the blood remains fluid after death. (Martin and Wolfenden.)

**Therapy.**—The infusion is made by triturating three seeds in a mortar with an ounce of cold water, to which is added an ounce of hot water. When cold, the solution is filtered; the resulting filtrate contains the active principle or ferment, which is highly irritating, and causes a purulent inflammation if introduced into the eye. It has accordingly been used in ophthalmological practice in the treatment of granular lids or trachoma. It is applied three times the first day and repeated on the second and third days, if necessary. This powerful application should be made with care, since Dr. T. E. Murrell describes three cases of stricture of the nasal duct that had resulted from its use too frequently repeated or carelessly watched.

The cases in which jequirity is apt to prove most serviceable are the later stages of trachoma or the fibrous state of the conjunctiva following trachoma. Good results also follow its use in vascular keratitis produced by a burn. The powdered drug may be applied by means of a camels-hair brush to the everted lid, a very small quantity being used at first in order to avoid an excessive reaction. Jequirity has also been employed in the treatment of chronic suppuration of the middle ear and in chronic metritis.

An emulsion, made by simply rubbing up the seeds with water, may be painted on with a brush for the treatment of unhealthy ulcers, lupus, and epithelioma.*

The emulsion † recommended by the writer can be prepared in the following manner: 200 grains of the bean are decorticated by being slightly bruised and cracked in a mortar; the red hulls are then carefully picked from the cotyledons and placed in a bottle covered with water. They are thus macerated for twenty-four hours, when they are again transferred to a mortar and thoroughly triturated until they are reduced to a smooth paste, when sufficient water is added to make the whole weigh 800 grains.

Abrus is not used internally. Injection of the infusion into the circulation in the lower animals causes death by septicæmia.

**ABSINTHIUM** (U. S. P.).—**Wormwood,** the leaves and tops of Artemisia absinthium. (Compositæ.)

**Preparations.**—Wormwood has no official preparations, though it enters into **Vinum aromaticum** (1 part to 100).

**Pharmacology.**—An herb, bitter and aromatic to the taste, indigenous to Europe, but naturalized in this country, and common along waysides. It contains **Absinthin,** a very bitter, yellowish-white powder. Absinthin is a glucoside, soluble in water, alcohol and ether. Wormwood also contains a volatile oil, to which its effects upon the nervous system are principally due. A tincture, flavored with aromatics, forms a cordial called **Absinthe,** used to a large extent in France, where its pernicious effects have attracted the attention of sanitarians. Absinthe produces profound disorder of the nervous system, epileptiform convulsions, and, if its use is continued, it renders the subject a physical wreck. These effects are similar to those produced by the volatile oil of wormwood upon the lower animals, in which it acts as a depressor of nervous energy, followed by stupor, clonic muscular spasms, and fatal coma. According to the experiments of Cadéac and Albin Meunier upon animals, the oil of wormwood, in small and large doses, possesses decided antiseptic properties.

**Toxicology.**—Poisonous effects may be counteracted by cold affusions, followed by friction of the skin and sinapisms, with careful administration of ammonia by inhalation, by the mouth, or by injection under the skin or into a vein. Evacuation of the contents of the stomach should be obtained by stimulating emetics, or, if these fail, by the stomach-pump. The treatment of **absinthism** calls for hygienic and restorative measures, particularly nerve tonics, in addition to the usual treatment of alcoholism. The use of absinthe as a stimulant should be discouraged by every means in our power, on account of the rapid deterioration, moral and physical, which it produces when habitually employed.

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* "Jequirity: its Uses in Diseases of the Skin," by the author. Transactions of the Medical Society of the State of Pennsylvania, 1884.

† Jequirity. See paper by author, in *Medical Bulletin*, November, 1884.

**Therapy.**—Wormwood has been used medicinally in the form of infusion (ʒi–ij to the Oj), a wineglassful being the dose as a tonic, or as an anthelmintic for children. The infusion is likewise employed as an enema for the destruction of thread-worms.

Hiccough due to flatulent distention may be checked by the administration of a few drops of absinthe. The dose of the powdered leaves is gr. xx–xl, or, of the oil, i–iij minims.

It is a domestic remedy for flatulent dyspesia and weak digestion. Externally, it has been used as a stimulant application to indolent ulcers. According to Dr. J. L. Corning, the volatile oil of wormwood is a valuable local anæsthetic, and may be serviceably applied for the purpose of relieving rheumatic pains. A wine slightly tinctured with wormwood, known as **Vermouth**, is sometimes given to increase appetite and hasten convalescence. Absinthin has been employed recently as a bitter tonic in doses of ¼ grain before meals.

**ACACIA** (U. S. P.).—**Gum Arabic**, a gummy exudation from Acacia Senegal Willdenow, and other species of Acacia. (Leguminosæ.)

### *Preparations.*

*Mucilago Acaciæ* (U. S. P.).—Mucilage of Acacia (34 parts, by weight, with water enough to make 100 parts).

*Syrupus Acaciæ* (U. S. P.).—Syrup of Acacia (Mucilage of Acacia, 25 parts, with syrup, 75 parts).

These are the only official preparations of acacia, and are simply used as vehicles. The density of the solution of gum arabic enables it to be used to suspend insoluble powders, or oils; in the latter case the resulting mixture is an *emulsion.* As an excipient, gum arabic enters into *Mistura Amygdalæ*, *Mistura Cretæ*, *Pulvis Cretæ Compositus*, *Mistura Glycyrrhizæ Composita*, and several official troches. It is a common dusting-powder for pills.

**Pharmacology.**—Gum arabic comes in white, or nearly colorless, translucent, irregular lumps, or coarse powder, brittle, odorless, almost tasteless. Its solution is valued for its adhesive qualities. Acacia also possesses some nutritive properties, and in the East it is eaten as food. It is soluble in water, but insoluble in alcohol. It has a faint odor and a mucilaginous, insipid taste. Acacia consists of a peculiar principle called arabin, or arabic acid, united with calcium, potassium and magnesium. Arabin is described as an amorphous, glassy and transparent substance when dry and of a milk-white color when moist. The preparations of acacia readily undergo acetous fermentation, unless some antiseptic is added to preserve them. As a rule, they require to be freshly made.

**Therapy.**—In bowel disorders and fevers, a thin mucilage, flavored with lemon and sweetened, makes a nourishing, bland drink which relieves thirst. Irritation in the throat is relieved by gum-arabic troches. Coryza is checked by a snuff of acacia and bismuth subnitrate, to which a little morphine can be added as in Ferrier's snuff:—

| | |
|---|---|
| ℞ Morphinæ sulphatis, | gr. v. |
| Pulveris Acaciæ, | ʒij. |
| Bismuthi subnitratis, | ʒvj. |

M. et. ft. pulvis.

For sore nipples a good combination is as follows:—

| | |
|---|---|
| ℞ Pulveris acaciæ, | ʒiv. |
| Pulveris sodii boratis, | ʒj. |
| Pulveris camphoræ, | gr. v. |
| Pulveris marantæ, | ʒij. |

M. Sig.: Dust over the surface.

Another serviceable application in some diseases of the skin is:—

| | |
|---|---|
| ℞ Pulveris acaciæ, | ʒiij. |
| Pulveris zinci oleatis, | ℥ss. |
| Lanolini, | ℥ss. |

M. Sig.: Ointment for sore nipples.

Powdered gum arabic may be used to check bleeding from leech-bites. The mucilage acts as a protective to slight burns and excoriations.

The emulsion may likewise be employed as a demulcent vehicle in bronchitis, and in irritation of the genito-urinary passages.

Gum arabic is chiefly employed for pharmaceutical purposes, in the preparation of emulsions, pills, etc.

**ACETAL, or Di-methyl Acetal.**

**Dose,** ʒj–ij.

**Pharmacology and Therapy.**—A colorless liquid, with ethereal odor and pungent, persistent taste, produced by oxidation of alcohol. In physical characters it resembles alcohol or ether, and is soluble both in alcohol and in water. It acts like alcohol in obtunding sensibility and producing sleep, preceded by lowering of blood-pressure and symptoms of intoxication. It has been administered as a hypnotic in doses of 1 or 2 drachms, but has nothing specially to recommend it.

**ACETANILIDUM** (U. S. P.).—**Acetanilid, or Phenyl-acetamide (Antifebrin*).**

**Dose,** gr. v–xv.

**Pharmacology.**—A derivative of aniline; a white powder, of neutral reaction, slightly pungent, without odor, slightly soluble in water and freely soluble in ether and in alcoholic solutions. It is not changed by acids or alkalies.

**Physiological Action.**—In ordinary dose the action of acetanilid is much less marked upon a person in health than when fever is present, as its most evident action is to reduce temperature, possibly by converting oxyhæmoglobin into methæmoglobin in the red blood-corpuscle, and interfering with oxidation. The effect does not depend upon sweating, since it occurs when no perspiration is produced. When an excessive quantity has been absorbed the alkalinity of the blood is lessened, the red corpuscles destroyed, the hæmoglobin is liberated, and eventually appears in the urine, which becomes dark-brown in color. The quantity of uric acid and urea present in the urine is increased. Large doses cause diastolic arrest of the heart, preceded by tremors, convulsions, depressed temperature, coma, motor and sensory paralysis. By smaller doses, the action of the skin and kidneys is increased ; the blood-pressure is at first elevated, but soon falls, and the heart's action becomes slower. It is claimed that in moderate amounts acetanilid acts as a cerebral and vaso-motor stimulant without causing any subsequent ill effects. In some cases, however, whether owing to peculiar susceptibility or impurity in the drug, symptoms of poisoning, cyanosis and collapse have resulted. Vomiting or profuse sweating, accompanied by profound prostration, have also been witnessed as the effect of moderately large doses of acetanilid. Toxic symptoms are especially apt to occur when acetotoluid is present as a contamination. Acetanilid is, in some instances, deposited upon the skin in crystalline form, or, at least, if the substance is not acetanilid, it is some product which results from its decomposition. The ill effects of the drug must be counteracted by use of external heat, vigorous alcoholic stimulation, together with the hypodermic use of ether, atropine, and strychnine, in order to support the respiration and circulation. In patients suffering with fatty or dilated heart, it should only be used with great caution, if at all. Owing to its action upon the blood-cells, it should not be used repeatedly or in large doses, in the low fevers. The prolonged administration of acetanilid gives rise to congestion of the liver, spleen and kidneys. In animals poisoned by acetanilid the heart, liver, kidneys, and other organs have been found affected by fatty degeneration. It is eliminated by the kidneys. According to the observation of Picciorini the ingestion of acetanilid produces peptonuria.

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*As the name "Antifebrin" was introduced by the projectors, and patented by them, it should not be used in scientific language or in prescriptions.

**Therapy.**—Acetanilid possesses antiseptic properties and may be advantageously used as a local remedy. It is an efficacious local application to chancroids and ulcerated chancres, used as a dusting-powder. In the form of an ointment containing 20 grains to the ounce it is of service in obstinate and irritable ulcers, erysipelas, eczema, herpes, urticaria and other diseases associated with considerable irritation. Combined with a mercurial it exercises a beneficial influence upon the lesions of psoriasis. A gargle containing 4 grains of acetanilid to the ounce of water may be beneficially employed in pharyngitis. Finely powdered acetanilid constitutes an excellent dressing to burns, scalds, contused and lacerated wounds. In many cases it has been found to prevent the production of pus. It has a beneficial influence upon ulcers and has been applied with success to mucous patches. In single doses of 15 grains or less, or in broken doses (gr. iij every hour or less), it will usually be followed by prompt reduction of the temperature to the normal. It is also antispasmodic, and has been used (doses gr. iii-v) in epilepsy, asthma, and whooping-cough. In whooping-cough it is given in the dose of $\frac{1}{2}$ grain to 5 grains, according to the age of the child. Improvement has taken place in chorea also in consequence of its administration. For the relief of pain it is less efficient than **Antipyrin**; but it has been employed in nervous affections, and to relieve the pains of facial neuralgia, locomotar ataxia, sciatica, etc., in doses of 10 to 15 grains. In migraine or neuralgic headache it is also an efficient remedy. Acetanilid is highly esteemed in the treatment of dysmenorrhœa, especially of young girls. In doses of 3 to 5 grains thrice daily it is of value in relieving sea-sickness. Acetanilid may be used with lupulin for the affections just named:—

| | |
|---|---|
| ℞ Acetanilid., | gr. c. |
| Lupulini, | gr. c. |

M. et ft. capsulæ no. xx.
Sig.: One or two capsules every two or three hours.

It may be employed with camphor, as—

| | |
|---|---|
| ℞ Camphoræ, | gr. l. |
| Acetanilid., | gr. c. |

M. et ft. suppositoria no. x.
Sig.: Insert one into the bowel every two or three hours for the pain of neuralgia.

In traumatic tetanus doses of 4 to 6 grains of acetanilid every third or fourth hour in conjunction with hypodermic injections of carbolic acid have been used with success.

A combination of value in the treatment of neuralgia, headaches, muscular and acute articular rheumatism, dysmenorrhœa, influenza, and various febrile affections, is thus given by Dr. W. Blair Stewart:—

| | |
|---|---|
| ℞ Acetanilid, | |
| Quininæ bisulphat., | āā gr. j. |
| Cocain. hydrochlorat., | gr. $\frac{1}{16}$. |

M.

The ingredients are compressed into the form of a tablet triturate, and one tablet can be administered every three or four hours according to its effect and the nature of the case.

Acetanilid is said to be of value in the treatment of obstinate vomiting, especially when due to nervous disturbance or extreme irritability of the stomach. It has also been employed with success in order to relieve the vomiting which follows surgical operations or the use of an anæsthetic.

Dr. Hollopeter recommends, in simple fevers of children, the following combination:—

| | |
|---|---|
| ℞ Acetanilid., | gr. xviij. |
| Hydrarg. chlor. mitis, | gr. j. |
| Sodii bicarb., | gr. xij. |
| Sacch. lact., | gr. xv. |

M. et ft. chart. no. xij.
Sig.: One every two hours until three are taken.

Acetanilid often proves very useful in acute inflammatory rheumatism, reducing the temperature and relieving the pain and swelling. It is not infrequently speedily efficacious in cases which have received no benefit from salicylic acid or the salicylates. It is capable of notably ameliorating the actual suffering, though it is not always able to prevent relapse. This remedy is likewise efficacious in neuralgic and muscular pain of rheumatic origin and in pain caused by compression or alteration of nerve substance. The headache and dysphagia of tonsillitis are allayed by the use of acetanilid.

It has been used in croupous pneumonia by Wroczynski, who believes that, in addition to reducing the temperature, it favorably influences the pathological process in the lung. It often proves of service in reducing the hectic fever of pulmonary tuberculosis. In scarlatina and other febrile affections among children acetanilid has given very excellent results, though here, also, it must be watched carefully, as a number of cases of intoxication from the drug have occurred among children. Grün claims to have secured rapid improvement in acute bronchitis from the administration of this substance. It has also proved beneficial in allaying reflex cough.

**Antinervin.**—This is the name given to a substance made by Radlauer and described as a combination of acetanilid, salicylic acid and a preparation of bromine in a peptonized form. The compound has been employed clinically by Dr. Ludwig Sior, of Darmstadt. This observer ascertained that when antinervin was given in 15-grain doses at hourly intervals for three hours, beginning about noon, it exercised a decided influence in reducing temperature. The minimum temperature was generally reached from six to nine hours after the administration of the first dose. About twelve hours from the same period the temperature began gradually to ascend. The reduction of temperature was not accompanied by unpleasant manifestations. As a rule, copious perspiration and, frequently, a sleep of several hours were produced. In acute rheumatism its action was equal to that of sodium salicylate. It was beneficial in trifacial neuralgia, migraine, the pain of transverse myelitis and in headache from various causes. As an analgesic it was usually given in doses of 15 grains, repeated, when needed, twice during the day. In the cases where it was used no deleterious effects upon the heart or nervous system were detected. After administration for weeks no disorder of sight or hearing, eruptions upon the skin, etc., were observed. Dr. Sior thinks that antinervin possesses an advantage over its components, given singly, in not exciting untoward effects. As it is scarcely soluble in cold water, it is best given in the form of powders or wafers.*

**ACIDUM ACETICUM** (U. S. P.).—**Acetic Acid,** composed of 36 per cent. absolute acetic acid and water 64 per cent.

**ACIDUM ACETICUM GLACIALE** (U. S. P.).—**Glacial Acetic Acid,** nearly or quite absolute acetic acid.

### *Preparation.*

*Acidum Aceticum Dilutum* (U. S. P.).—Diluted Acetic Acid contains 6 per cent. absolute acetic acid.

Acetic acid is the basis of the *Aceta,* or the *Official Vinegars:* Acetum Opii, Acetum Scillæ.

**Pharmacology and Poisoning.**—Acetic acid is a clear, colorless fluid, having a strong vinegar-like odor, an acid taste and reaction. It mixes with water or alcohol in all proportions. Glacial or absolute acetic acid is a crystalline solid at 59° F.; it attracts moisture from the atmosphere and should therefore be kept in well-stoppered bottles. Acetic acid in the strongest form acts as an escharotic to the tissues; and, if taken internally, is a violent corrosive poison, causing vomiting of sour-smelling liquid, with intense pain, followed by convulsions and fatal coma. If the case is prolonged, gastro-enteritis is produced by the acid. It has some antiseptic qualities, and slightly increases the acidity of the urine.

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* *Deutsche Med. Zeitung,* No. 57, 1893.

Vinegar, which contains from 6.3 to 7 per cent. of acetic acid, has a decided inhibitory effect upon the growth of micro-organisms. The use of a 60-per cent. acetic acid is recommended by good authority as a menstruum for extracting the active principles of drugs, with which it seems, in many instances, to form soluble compounds.

Pyroligneous acid, or crude acetic acid, a dark brown fluid having a smoky odor, obtained from the destructive distillation of wood, may be used with advantage as a disinfectant. Glacial acetic acid is partially eliminated by the intestinal canal, but chiefly by the kidneys. In cases of poisoning, milk or flour and water should be freely given, and vomiting encouraged. Weak alkaline solutions should be administered as chemical antidotes.

**Therapy.**—The glacial acid is used successfully as an application to lupus, epithelioma, ulcers, papillomata, or warts, and nasal hypertrophies, and also as an application to ringworm and other forms of tinea. A mixture of 30 parts of acetic acid and 2 parts of salicylic acid is esteemed an efficacious application to venereal warts. Vinegar (not official), or dilute acetic acid, has been given internally to check night-sweats and to relieve diarrhœa. After constipation has been overcome vinegar has been employed with good effect in the treatment of lead colic. Vinegar is a convenient antidote for poisoning by caustic alkalies. It is also used externally for the relief of headache, and the entire surface of the body may be sponged several times a day with vinegar and water to reduce high temperature and acid sweating. It will also prevent the formation of bed-sores. The vapor of vinegar diffused through the sick-room is, according to Dr. S. J. Bumstead, of Decatur, Ill., beneficial in cases of catarrhal, membranous and diphtheritic croup. Engelmann claims that the direct application of vinegar answers a good purpose in diphtheria. Warholm recommends the use of vinegar for the purpose of relieving or preventing nausea, vomiting and headache following the inhalation of chloroform. A compress saturated with the liquid is placed over the nose and kept in that position until consciousness has returned.

The following liniment is useful in chronic rheumatism of the joints. It is Stokes's or St. John Long's liniment, the Linimentum Terebinthinæ Aceticum of the National Formulary:—

| | |
|---|---|
| ℞ Ol. terebinth., | f℥iij. |
| Ovum recent., | no j. |
| Ol. limonis, | fʒj. |
| Acid. acetic., | fʒv. |
| Aquæ rosæ, | f℥iiss. |

M. et ft. linimentum.

Properly diluted, acetic acid is sometimes able to mitigate the intense pruritus of urticaria. It is capable also of checking moderate bleeding, as from leech-bites, superficial wounds, and epistaxis. In post-partum hæmorrhage, weakened acetic acid, or vinegar and water, expressed from a mop or sponge into the cavity of the womb, will cause that organ to contract and prevent the loss of more blood. Acetic acid may be of service in bleeding from the stomach. Dr. E. Maguire reports good results in acute gonorrhœa from the use of injections, consisting of 1 part acetic acid to 4 of water.*

## ACIDUM ARSENOSUM (U. S. P.).—Arsenous Acid.

**Dose**, gr. $\frac{1}{30}$–$\frac{1}{12}$.

*Preparations.*

*Liquor Acidi Arsenosi* (U. S. P.).—1 per cent. *Dose*, ♏i–x.

*Liquor Potassii Arsenitis* (U. S. P.).—1 per cent. Fowler's Solution. *Dose*, ♏i–x.

*Liquor Sodii Arsenatis* (U. S. P.).—1 per cent. of Arsenate of Sodium. *Dose*, ♏i–x.

*Liquor Arseni Chloridi.*—Solution of Arsenic Chloride. Dose, ♏i–x.

*Liquor Arseni et Hydrargyri Iodidi* (U. S. P.).—1 per cent. each Arsenic Iodide and Mercuric Iodide. Donovan's Solution. *Dose*, ♏i–x.

*Arseni Iodidum* (U. S. P.).—Arsenic Iodide. *Dose*, gr. $\frac{1}{24}$–$\frac{1}{8}$.

*Sodii Arsenas* (U. S. P.).—Sodium Arsenate. *Dose*, gr. $\frac{1}{24}$–$\frac{1}{12}$.

*Arseni Sulphidum.*—Arsenic Sulphide. *Dose*, gr. $\frac{1}{20}$–$\frac{1}{8}$.

**Pharmacology.**—A white, almost tasteless, heavy powder, or in dense mass of crystals, soluble in 30 parts of cold water or 15 of boiling water; also in glycerin and in hydrochloric acid solution. It is arsenous oxide ($A_2O_3$), and is prepared by roasting the ore and sublimation. When thrown upon burning charcoal it volatilizes and smells like garlic, the fumes being very poisonous. It is recognized by **Marsh's test**: by the generation of hydrogen in the presence of a solution containing arsenic, arsenuretted hydrogen is produced, which leaves a dark ring on a cold plate held in its flame; this also is extremely poisonous if inhaled. **Reinsch's test** consists in adding a few drops of hydrochloric acid to the suspected solution, and immersing in it a polished plate of copper; the solution being heated metallic arsenic is deposited upon the copper. Arsenic possesses antiseptic qualities, and preserves bodies from decay; when death occurs from its effects, it, therefore, remains for a long time in the stomach, liver, and other organs. Owing to its tastelessness and want of color, arsenous acid is frequently given with homicidal intent, but it is the most easily recognized by its tests of all the mineral poisons. Symptoms of poisoning have resulted from the ingestion of ½ grain of arsenous acid, and death has been produced in the adult by doses of 2 to 4 grains. On the other hand, a case has recently been reported in which recovery occurred after about 154 grains had been taken. **Paris green**, or **Scheele's green**, is an impure copper arsenite, used for killing potato-bugs, and as a pigment in wall-papers.

**Clemens' solution** of arsenic bromide is made by boiling powdered arsenous acid and potassium carbonate (of each 57½ grains) in distilled water (8 fluidounces, and the resulting solution cooled and increased by the addition of more distilled water (up to 11½ ounces), to which is added pure bromine (115 grains). The fluid is kept four weeks, being frequently shaken during the first week, or until it forms a permanently clear solution. The dose is from 1 to 5 drops daily, freely diluted and given after meals.

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* Annual of the Universal Medical Sciences, 1890, vol. v.

**Physiological Action.**—To the surface of the skin, if moistened, arsenic acts as an irritant, and produces inflammation and sloughing. In order to obtain its full effects as a caustic, the epidermis should first be removed; but this is not advisable because of the severe pain which attends its use, and on account of the danger of absorption of the poison, especially when used about the mouth. Arsenic is readily absorbed, and is supposed to enter into combination with the red blood-corpuscles. It diminishes the elimination of carbonic acid and probably of urea.

Taken in small doses, arsenic exerts a tonic effect upon the nervous system, stimulates the circulation, and permits an increased amount of exercise to be taken without fatigue or short breathing. Large doses depress the action of the heart and diminish blood-pressure. The respiratory centre is stimulated by small and depressed by large quantities. Medicinal doses decrease and excessive amounts increase the metamorphosis of nitrogenous tissue. When administered for a long time the system becomes habituated to its use, and much larger doses may, in some cases, be taken without serious consequences. The arsenic-eaters of Styria can take 8 to 10 grains at a dose; they also administer it to the horses in order to improve their condition and enable them to perform more work. It is said that only very few are able to tolerate such large doses, and they are careful not to drink water after taking it; so that absorption probably goes on very slowly, at the same time that it is eliminated rapidly by the kidneys. It is possible that the tolerance may be partly explained by heredity; at all events, imitators of the arsenic-eaters, sooner or later, experience the toxic effects of the drug. Inflammation of the stomach is one of the results of poisoning by arsenic, even when introduced per enema or absorbed through the general surface. The urine becomes scanty, albuminous, or bloody. The skin is affected by arsenic; superficial œdema, especially of the face, appears, and may be followed by eczema, urticaria, herpes zoster, bronzing in patches, or exfoliation of the epidermis. The hair and nails may fall and conjunctivitis may occur. If the remedy is not discontinued at this time the puffiness of the eyelids and face may increase until a general anasarca is the result. Cases of idiosyncrasy have occasionally been observed in which the prolonged administration of arsenic in medicinal doses has given rise to urethritis, which gradually abated when the use of the drug was abandoned. The digestive organs are stimulated by small doses, but large ones cause gastro-enteritis, with burning pain in the epigastric region, vomiting, purging, and collapse resembling Asiatic cholera. In fact, when symptoms of this kind appear in the absence of an epidemic of cholera, they are very likely caused by arsenical poisoning, and should always excite suspicion of the administration of arsenic. Arsenical poisoning is occasionally accompanied by paralysis of one or more extremities. According to the observation of Dr. Thomas Buzzard, the continued use of arsenic will occasionally give rise to multiple neuritis.

In exceptional cases of poisoning by arsenic the gastro-intestinal symptoms are not prominent, but profound collapse or stupor may be the chief manifestation and herald a speedy death. After recovery from the immediate effects of overdoses of arsenic various disorders, especially of the alimentary canal and nervous system, may occur as a result. Myelitis, peripheral neuritis, motor paralysis, hyperæsthesia or anæsthesia are among the after-effects of this drug. A case fell under the observation of Dr. Roget in which epilepsy occurred as one of the secondary effects of the poison. Chronic arsenical poisoning is not uncommon among workmen on account of the extensive employment of this substance in the arts. A summary of the most typical manifestations of this form of toxæmia is thus given by the late Prof. Taylor: "Dryness and irritation of the throat, irritation of the mucous membranes of the eyes and nostrils, dry cough, languor, headache, loss of appetite, nausea, colicky pains, numbness, cramp, irritability of the bowels, attended with mucous discharges, great prostration of strength, a feverish condition and wasting of the body."

In workmen employed in making arsenical dyes local affections are produced by constantly handling the substance. Among these effects are ulcers about the roots of the nails, papular and eczematous eruptions and erysipelas. To these local difficulties the constitutional symptoms of chronic intoxication may subsequently be added. After death from arsenic, fatty degeneration of the heart, liver, kidneys, and other organs has been found. The temperature is depressed by toxic doses. Fly-poison, or cobalt, an impure arsenic oxide, is sometimes swallowed by mistake; so is rat-poison, made by mixing arsenic and meal ("rough-on-rats" contains 50 per cent.). Arsenic is excreted from the body by the kidneys and intestinal canal. It also escapes by way of the skin, and it has been found in different secretions, as the saliva, tears and milk of nursing women to whom it had been administered.

As arsenical intoxication is occasionally due to wall-paper the following test is of easy application in suspicious cases: A small piece of the paper placed in strong ammonia water will give rise to a bluish color if arsenic or copper be present. A yellowish deposit upon a crystal of silver nitrate, moistened with a drop of the fluid, points to the presence of arsenic. Death has been caused by the ingestion of 2 grains of white arsenic. On the other hand, considerable amounts have been taken without fatal consequences; the immunity being, in all probability, due to the insoluble form in which the poison was taken. Death from arsenic usually occurs within from eighteen hours to three days, but it has taken place in twenty minutes, while, on the contrary, the patient has lingered until the sixteenth to twentieth day.

**Antidotes.**—The antidotes to arsenous acid are the freshly-precipitated sesquioxide of iron, or the official ferri oxidum hydratum cum magnesia, of which about 20 grains must be given for each grain of arsenic swallowed. The solution of dialyzed iron is also a convenient preparation for this purpose. Calcined magnesia and milk may be freely administered, and the stomach emptied by the stomach-pump, or by free vomiting. Oleaginous or mucilaginous drinks are also serviceable. If purging has not occurred the bowels should be emptied by magnesia sulphate or Rochelle salts. The case subsequently may require treatment for resulting gastric inflammation. The autopsy reveals lesions of the œsophagus and stomach, with erosions and ecchymoses, congestion of the lungs, and fatty degeneration of different organs. The arsenic may be detected not only in the contents of the stomach, but also in the urine and in the tissues, especially the liver and great nerve-centres.

**Therapy.**—When administered internally arsenic has occasionally shown considerable power over morbid growths, and is the only remedy we have at our command that has any effect upon the development of cancer of the viscera. In epithelial cancer and other superficial growths arsenical paste has been employed (cinnabar, 70; dragon's blood, 22; arsenous acid, 8), but, as previously stated, it is a very painful treatment, and may only be applied to a small area at a time on account of the danger of producing toxic effects.*

Lassar has reported several cases of epithelioma of the face, in which the administration of arsenic was followed by the gradual involution and cicatrization of the growths.

Dr. Wight regards arsenic bromide as the most efficacious agent in preventing the dissemination and extension of malignant growth. In sarcoma he recommends a combination of this preparation with calcium carbonate.

In ague and chronic malarial disorders, and also as a prophylactic against malarial poisoning, arsenic is used very effectually in small doses, and may be combined with quinine and iron:—

| | |
|---|---|
| ℞ Liq. potassii arsenitis, | ♏iii–v. |
| Tr. cinchona comp., | f℥ij. |

M. Pro dosi.

| | |
|---|---|
| ℞ Sodii arsenatis, | gr. j. |
| Mass. ferri carbonatis, | gr. xx. |
| Quininæ sulph., | gr. xx. |

M. et ft. pil. no. xx.
Sig.: One three times a day.

| | |
|---|---|
| ℞ Arseni sulphidi, | gr. ij. |
| Aloini, | gr. j. |
| Ferri pyrophos., | gr. xl. |

M. et ft. pil. no. xx.
Sig.: One three times a day.

Dr. C. F. Bryan believes that arsenic acts as a prophylactic against scarlet fever and, perhaps, against diphtheria and influenza. The use of arsenic in pulmonary tuberculosis is advocated by Dr. Karl Hochhalt, who found that in fifty cases the appetite improved, the weight increased and the fever diminished while Fowler's solution was being administered. In neuralgia, arsenic frequently exercises a very happy effect, especially when given in the form of the solution of sodium arsenate.

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* The ignorant or excessive use of an arsenical paste or powder has been known to cause death by absorption.

Larger doses are required for some cases of chorea, but the effect is very marked. According to Dr. William Murray, of Newcastle-on-Tyne, the most effectual method of treating chorea is by the administration of large doses of Fowler's solution. He begins by giving 15 or 20 drops three times a day, in the middle of a meal. He claims that these heroic doses may be given for a few days without disturbing the stomach, and that it almost infallibly cures chorea within a week.

A course of arsenic has a valuable tonic influence in organic heart disease, and under its use dyspnœa, palpitation and œdema improve. It also corrects intermittency of the pulse. This remedy is of service in certain forms of chronic albuminuria. Dr. Phillips has employed it with advantage for many years in albuminuria following scarlatina. Arsenic will not infrequently succeed in relieving hæmorrhoids.

It may be administered with advantage thus:—

| | |
|---|---|
| ℞ Liq. sodii arsenatis, | f ʒ j. |
| Fl. ext. Hoang-Nan, | f ℥ j. |
| Elix. gentianæ ferrat., | f ℥ v. |

M. Sig.: One teaspoonful in water after meals. Used in neuralgia and chorea.

A pill highly extolled in the treatment of neuralgia is:—

| | |
|---|---|
| ℞ Arseni iodid., | gr. j. |
| Extr. belladonn., | |
| Morphin. valerianat., | āā. gr. viij. |
| Pulv. extr. gentianæ, | gr. v. |
| Pulv. extr. aconiti, | gr. v. |

M. et ft. pil. no. lx. Sig.: One to three pills during the day.

Some spasmodic disorders of respiration, asthma, hay fever, and chronic catarrhal bronchitis are controlled by arsenic, and, if there is no acute inflammation it may be used with the atomizer. Arsenic is of service in catarrhal pneumonia. Cases of periodic sneezing, dependent upon reflex action, have been cured by the use of this remedy.

In irritative dyspepsia, with morning vomiting and clean, red tongue, arsenic is of service; also in the diarrhœa coming on immediately after eating. In skin diseases arsenic is valuable in proportion to the absence of irritation or acute inflammation. In all chronic processes, especially when accompanied by desquamation or infiltration of the skin, such as psoriasis, the persistent use of small doses is often curative; also in the dry form of eczema and impetigo, as well as in pemphigus and lichen. In the vesicular or bullous eruptions of children small and repeated doses of arsenic are usually followed by speedy improvement. It is contra-indicated in the early stage of each of these affections except psoriasis.

Dermatitis herpetiformis and recurrent herpes are benefited by the administration of arsenic. It is generally of service also in the treatment of chronic urticaria. The internal administration of arsenic will sometimes remove warts from the hands. The persistent administration of small doses of arsenic is usually of service in the small pustular and papular forms of acne, especially in cases dependent upon debility or anæmia.

The following are serviceable formulæ in the diseases referred to:—

℞ Liq. potassii arsenitis, . . . . . . . . . . f℥j.
Tinct. nucis vomicæ, . . . . . . . . . . f℥ij.
M. Sig.: From 15 to 20 drops in water three times a day.

℞ Sulphuris sublimati, . . . . . . . . . . gr. c.
Acidi arsenosi, . . . . . . . . . . gr. j.
M. et ft. capsulæ no. xx.
Sig.: One after meals.

In diabetes mellitus, the solution of arsenic bromide (not official) taken in Vichy water after each meal has produced remarkable results in the hands of Clemens, probably owing to its action upon the liver.

Quinquaud has experimentally demonstrated that in animals fed with arsenic diabetes cannot be produced by lesion of the bulb. In disease of the liver or kidneys, especially the early stage of cirrhosis, arsenic sometimes has a very decided effect. In vomiting and diarrhœa, especially in infancy, copper arsenite in infinitesimal doses (gr. $\frac{1}{100}$ to water f℥iv, a teaspoonful being given every hour or less) has been followed by good results; but the older method of using Fowler's solution in the same way is probably better because less poisonous than the copper arsenite; the effect being largely due to the antiseptic action of the arsenic, which acts more efficiently in the soluble form.

The vomiting of pregnancy is often remarkably relieved by the administration of a drop of Fowler's solution immediately before each meal. The same preparation is valuable in chronic gastritis (especially when it has been produced by alcohol), in chronic gastric ulcer, and cancer of the stomach. Arsenic is sometimes beneficial in chronic rheumatism. In rheumatoid arthritis Phillips testifies that under the continued use of this drug he has known the joints to return to their natural size. In angina pectoris, Anstic asserted that arsenic was of decided service in mitigating the severity of attacks, especially in anæmic patients suffering from overwork and anxiety. Syphilitic affections are sometimes better treated by the combination of mercury with arsenic than by mercury alone. Donovan's solution is especially useful in old syphilitic skin lesions.

Dr. H. Smith has reported a case of secondary syphilis, in which arsenic produced a rapid improvement after mercury and iodide of potassium had failed. An isolated case of trichinosis was successfully treated by Dr. Merrill by means of Fowler's solution in 5-drop doses thrice daily, gradually increased until constitutional effects were produced. Previous to its administration the patient was steadily growing worse. Donovan's solution in doses of 10 minims three times a day is said to do good in gleet. Finally in chlorosis and anæmia the tonic effects of arsenic may well be combined with those of quinine and of iron. The usual dose of arsenous acid is $\frac{1}{24}$ grain, to be cautiously increased. The best method of administration is in solution.

In a case of leukæmia which Dr. Drew treated by means of an arsenical solution in ascending doses until the physiological limit was reached, the spleen, which had been greatly enlarged, became, in the course of three months, diminished in size, the proportion of white blood-corpuscles was decreased and the number of red corpuscles was augmented. When amenorrhœa is caused by congestion of the uterus, anæmia or chlorosis, the administration of arsenic will usually be followed by a return of the catamenial flow.

Radcliffe was the first to use arsenic hypodermically for the relief of chorea, in 1866, and since then it has been frequently used in scaly skin diseases, lymphadenomata, and nervous disorders. This method is also of advantage in the treatment of obstinate cases of malaria which have resisted the action of quinine. Very marked hypertrophy of the liver and spleen due to malaria may be reduced by the injection of Fowler's solution.

The ointment of oleate[*] of arsenic is also a useful application in the treatment of old ulcers, epithelioma, and lupus. The following combination will be found of service in the diseases just named:—

| | |
|---|---|
| ℞ Morphinæ sulphatis, | gr. ij. |
| Zinci chloridi, | gr. v. |
| Pulveris marantæ, | ʒj. |
| Ungt. arseni oleatis, | ℥ss. |

M. Sig.: Apply on old muslin for several hours.

Arsenic iodide (gr. iv or v–ʒj) in ointment is a valuable stimulating application in old dry eczema. In lupus it may be made stronger, or we may combine it with corrosive sublimate:—

| | |
|---|---|
| ℞ Hydrarg. chlor. corros., | ʒiiss. |
| Acidi arsenosi, | ʒj. |
| Hydrarg. sulphidi rubri, | gr. xl. |

Mix with water to a paste and apply with a brush.

In warts, Unna advises the application of mercurial ointment containing from 5 to 10 per cent. of arsenic. E. Mansel Sympson declares that the internal administration of small doses of arsenic has a curative effect upon warts. After a week or two of this treatment the growths begin to disappear.

**ACIDUM BENZOICUM** (U. S. P.).—**Benzoic Acid.** See Benzoinum.

**ACIDUM BORICUM** (U. S. P.).—**Boric Acid,** formerly **Boracic Acid. Dose,** gr. v–xxx.

*Preparation.*

*Sodii Boras* (U. S. P.).—Sodium Borate, or Borax. *Dose,* gr. v–xxx.

**Pharmacology.**—Boric acid is in transparent, colorless, six-sided plates, soluble in 25 parts of water or 15 parts of alcohol, and in 3 parts of boiling water of 5 of boiling alcohol. The alcoholic solution has a green flame. Borax is soluble in 16 parts of cold water, but not in alcohol. The solubility of boric acid is greatly increased by the addition of borax. When a mixture of equal parts of boric acid, borax and water are heated together a solution is obtained known as the tetraborate of sodium, which is apparently a new salt, as it is of neutral reaction. Sodium tetraborate is a white, unctuous powder, readily soluble in water and free from caustic or toxic properties. Boric acid has a feebly-acid taste and borax a sweetish, alkaline taste and alkaline reaction. **Boroglyceride** is a combination of boric acid (62 parts) and glycerin (92 parts). When diluted with an equal quantity of glycerin, it makes the 50-per-cent. boroglyceride, in which form it is used as an antiseptic. Lister's antiseptic ointment for dressing wounds is made by adding 1 part each of boric acid and white wax to 2 parts each of paraffin and almond-oil. Borated lint or borated cotton-wool (absorbent cotton) is made by steeping the substance in a saturated solution of boric acid and allowing it to dry.

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[*] See Ointments and Oleates, especially in Skin Diseases, by the author. F. A. Davis, 1890.

**Physiological Action and Therapy.**—Boric acid is antiseptic. According to the observations of Gaucher it arrests the progress of tuberculosis in animals. The presence of borax in food notably retards the action of saliva upon starch, as shown by experiments made by C. T. Fox, under the direction of Professor Weber, of Columbus, Ohio. This conclusion has been confirmed by Professor R. H. Chittenden, who extended his researches to an examination of the effect of boric acid and borax upon gastric and pancreatic digestion. From Professor Chittenden's experiments it would seem that boric acid has little or no power to check the proteolytic action of neutral solutions of trypsin. Borax, in an alkaline as well as a neutral pancreatic juice, increases the digestive action of the fluid upon albuminous substances. As regards gastric digestion, the presence of moderate amounts of boric acid increases the activity of the ferment. Large amounts of boric acid tend to check gastric digestion, but even in that case the retardation is not very pronounced.* It is entirely unirritating when applied to the skin, and has been used as a dressing for wounds.

Boric acid is rapidly eliminated in the urine and is said by Max Grüber to increase the elimination of urea and the quantity of urine passed. It is also removed by the saliva, perspiration and fæces. Suppuration of the ear, or running from the ear, is cured by cleansing the canal and insufflating finely-powdered boric acid. Accidents from its use are rare; but a few cases have been observed in which boric acid excited cutaneous eruptions. The eruptions which may be excited by the internal use of boric acid assume a number of forms. Erythema, papules, blebs, generalized urticaria and confluent rubeola-like rashes have been observed. Disturbances of the nervous system have also been caused. The symptoms have been attributed to non-elimination of the acid by the kidneys. In the treatment of aural suppurations and wounds Dr. Jaenicke, of Görlitz, recommends sodium tetraborate, which is also considered as a valuable application in conjunctivitis and keratitis and is said to restrain the formation of pus. Dr. J. Harris Pierpont believes that finely powdered boric acid is a ready means of diagnosticating small perforations of the membrana tympani. After the external ear has been cleansed and dried the powder is blown into the canal until the membrane is completely coated. When an examination is made, a few hours subsequently, the perforation, if present, will appear as a dark or discolored spot upon a white field, the discharge, in escaping through the opening, having partially or wholly dissolved the acid. Powdered boric acid is regarded by McCandliss† as an excellent application to leg ulcers.

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* *The Dietetic and Hygienic Gazette*, Feb., 1893.

† *China Medical Missionary Journal*, December, 1890.

A solution of boric acid is an efficient application in conjunctivitis. The saturated solution is used in various chronic, scaly, and parasitic skin eruptions, and is the best remedy for bromidrosis of the feet, or fetid perspiration. Among the beneficial combinations are:—

| | |
|---|---|
| ℞ Acidi borici, | ʒss. |
| Glycerini, | f℥ss. |
| Tinct. opii, | f℥ss. |
| Aq. camphor., | f℥j. |

M. Sig.: Ten drops to be instilled into the ear for ear-ache. (Dr. Prout.)

| | |
|---|---|
| ℞ Acidi borici, | ʒiij. |
| Bismuthi subnit., | ʒiij. |

M. Sig.: For running from the ear and in excessive and fetid perspiration.

| | |
|---|---|
| ℞ Acidi borici, | ʒij. |
| Pulv. zinci carb. imp., | ℥ss. |

M. Sig.: In acute eczema and erythema.

| | |
|---|---|
| ℞ Acidi borici, | ʒj. |
| Aquæ hamamelidis dest., | f℥iv. |

M. Sig.: Use in fetid perspiration and in an oily state of the skin.

In pharyngitis, Dr. Capart prescribes the following combination:—

| | |
|---|---|
| ℞ Sodii boratis, | ʒj. |
| Sodii salicylatis, | ʒss. |
| Decoctionis althææ, | f℥vj. |

M. Sig.: To be given in divided portions through the day.

Whitla, Keegan and others have employed boric acid in typhoid fever with good results. The temperature was lowered and the diarrhœa checked. Dr. Tortchinsky* has used this remedy in 240 consecutive cases of typhoid fever, and reports very favorably of its action. It is stated that the course of the disease was considerably shortened and that complications were very rare. The effect of the boric acid was enhanced, in the late stages accompanied by cerebral symptoms, and in relapses, by a combination with quinine. The same writer has obtained equally satisfactory results from the use of boric acid in the summer diarrhœa of children.

Good results have been obtained in erysipelas, even of the phlegmonous form, by the application of lotions containing this remedy.

Borax in substance is applied to aphthous sore mouth in infants, mixed with white sugar. Aufrecht recommends the internal administration of borax in the stomatitis of elderly and debilitated persons in whom the disease extends to the œsophagus and stomach, causing dysphagia and defective nutrition. A piece of borax of about 2 or 3 grains placed in the mouth is said to be useful to speakers and singers by producing salivation and relieving hoarseness; its solution is a cooling application to superficial inflammations of the skin, and for pityriasis versicolor and seborrhœa of the scalp, or dandruff.

The late Dujardin-Beaumetz used the following as a favorite prescription for a dentifrice:—

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* *British Medical Journal*, January 14, 1893.

| | |
|---|---|
| R Acid borici, | ʒvi ¼. |
| Acid carbolici, | gr. xv. |
| Thymol, | gr. iv. |
| Aquæ, | Oj ¾. |

M. et adde—

| | |
|---|---|
| Spir. menthæ, | gtt. x. |
| Spir. anisi | ʒij ss. |
| Cocci., | q. s. ad colorand. |
| Sp. vini rect., | f ℥iij. |

M.

The above author lays stress upon the importance of attention to the teeth in diabetes mellitus, in order to avoid lesions of the mucous membrane, gums and teeth.

A lotion containing borax may be used in order to allay the itching of urticaria and paræsthesia. Internally, borax, in 20-grain doses, relieves irritable bladder and reduces the acidity of the urine. It has, in some instances, given encouraging results in epilepsy. The general tendency of borax is to diminish the number of attacks. It will sometimes succeed in cases which potassium bromide has failed to relieve. A combination of the two drugs has disappointed expectation. It is recommended to begin with doses of 7½ to 15 grains and rapidly increase the amount until the limit of tolerance or a decided effect upon the disease is produced. Professor Mairet, of Montpelier, states that when daily doses of 2 drachms are insufficient to hold the attacks in check it is to be feared that larger doses will prove no more successful. When the paroxysms have been restrained he advises the reduction of the amount to about 1 drachm *per diem.* Among the disadvantages of the prolonged administration of borax are salivation, impairment of appetite and digestion, diarrhœa, emaciation, swelling of the face, œdema of the lower extremities, cutaneous rashes, conjunctivitis, fissures of the lips, fall of the hair and alterations in the nails.

According to Dr. G. Lemoine, a blue line, resembling that of lead poisoning, may form upon the gums after the prolonged use of borax.

Gowers has, in several instances, when administering borax in epilepsy, seen psoriasis develop, and is disposed to attribute the disease of the skin to the influence of the drug. Both psoriasis and eczema have been attributed by other writers to the ingestion of borax. Borax is said to be better borne when administered in glycerin instead of aqueous solution, or when intestinal antisepsis is conjoined. Dr. Ch. Féré, after an experience of six years with borax in epilepsy, regards it as distinctly inferior to the bromides in efficacy. The renal trouble excited by prolonged use of the drug does not always subside on suspension, and one case is mentioned which terminated fatally from uræmic coma. When the epileptic attacks are nocturnal a portion of the drug should be given during the night. In order to cover the taste of borax M. Gay recommends solution in an infusion of liquorice with the addition of a little glycerin; in sweetened milk and strong coffee; or in syrup of orange-peel with julep. Syrup of orange is said to be the best vehicle. Professor Lashkevich considers the borate of ammonium of service in phthisis. It is said to reduce the expectoration and, in some cases, the fever. He combines it with conium, hyoscyamus or some other sedative. Dr. Golding-Bird asserts that borax cannot be employed with impunity in women, as it has a stimulant action upon the uterus, and states that in two instances he has seen it produce abortion. Some have employed borax for the purpose of exciting uterine contractions in protracted cases of labor. It has also been administered in amenorrhœa and dysmenorrhœa.

Dr. Sacaze, of Montpelier, reports an excellent result from the use of borax in a case of paralysis agitans. It was first given in 4-grain doses three times a day. After a few days the dose was gradually increased to double that quantity. Improvement was rapid.

Several cases of poisoning, some of them fatal, have been reported, apparently due to the local application of boric acid or its solutions to internal cavities, the vagina or stomach. The symptoms were reduction of temperature, depression of spirits, sickness of the stomach, feeble pulse and, in some instances, hiccough and ecchymoses. The mind usually remained clear, but coma sometimes occurred.

Boroglyceride (50 per cent.) is a pleasant and efficient application for conjunctivitis, pharyngitis, and as a dressing for wounds and granulating surfaces, having the important advantage of not being poisonous. It is especially recommended for the local treatment of diphtheria. Boroglyceride ointment, made by adding it to unguentum aquæ rosæ, is a pleasant application for sunburn, pruritus, and other skin affections. Boric-acid ointment (in lanolin or zinc ointment, 1 to 6) is used as a dressing for wounds and ulcers. The solution of boroglyceride is a valuable application in chronic eczema of the palms of the hands and the soles of the feet. It is also useful in subacute and chronic eczema of the genital organs, especially when the scrotum is invaded. It can be prescribed with witch-hazel.

The addition of borax is said to increase the laxative effect of glycerin suppositories.

**ACIDUM CARBOLICUM** (U. S. P.).—**Carbolic Acid, Phenol.**
**Dose**, gr. ss–ij. If liquefied, ♏i–ij.

**ACIDUM CARBOLICUM CRUDUM** (U. S. P.).—**Crude Carbolic Acid.**

*Preparations.*

*Unguentum Acidi Carbolici* (U. S. P.).—Ointment of Carbolic Acid, 5 per cent.
*Sodii Sulphocarbolas* (U. S. P.).—Sodium Sulphocarbolate. *Dose*, gr. v–xxx.
*Glyceritum Acidi Carbolici* (U. S. P.).—Glycerite of Carbolic Acid, 20 per cent.

**Pharmacology.**—Carbolic acid is a liquid obtained during the distillation of coal-tar between the temperatures of 180° and 190° C. (356° to 374° F.). What is called crude carbolic acid is distilled at a somewhat lower temperature, and contains also cresylic acid and other substances which render it unfit for medicinal use except as a disinfectant for drains, etc. A mixture of coal-tar constituents has, under the name of saprol, been proposed as a cheap disinfectant. Saprol is a dark brown, oily substance. It floats upon the surface of water, which extracts from it carbolic acid, cresol and other soluble products of coal-tar. In 1-per-cent. solution saprol is an energetic agent and is well adapted to the disinfection of dejecta in barracks, prisons and schools.

It must be borne in mind when using this fluid that it is of an inflammable nature.

Pure carbolic acid is crystalline at ordinary temperatures, and at first is colorless, but reddens after exposure to the air. It has a characteristic odor and pungent taste; it is very soluble in all the usual menstrua, having the peculiarity of being liquefied by 5 per cent. of water; but the further addition of water produces turbidity until the proportions are reversed (1 to 20), when it remains permanently clear and is not affected by further dilution. It resembles creasote in its disinfectant properties, but differs from it by being converted into picric acid when nitric acid is added to it; whereas, with creasote, nitric acid forms oxalic acid. Resorcin is also of a similar character, but is in the form of a powder. Both creasote and resorcin will be considered separately.

The following unofficial preparations are sometimes used:—

### *Unofficial Preparations.*

*Aqua Acidi Carbolici* (ʒij in Oj, or glycerite, ʒx in Oj). *Dose*, fʒi–ij; also as a wash, gargle, or spray.

*Carbasus Acidi Carbolici* (gauze, containing carbolic acid 1, resin 5, paraffin 7 parts).

*Oleum Acidi Carbolici* (1 in 20 of olive- or cottonseed-oil).

*Suppositoria Acidi Carbolici* (each containing 1 grain).

*Campho-Phenique.*—Carbolic-Acid Camphor. Dissolve 9 parts acid in 1 of alcohol, and mix with 25 parts camphor, forming a clear, oily solution.

*Liquor Sodii Carbolatus.*—Phenol-Sodique. Carbolic acid, gr. clxxxviij; caustic soda, gr. xxxj; water, f℥iv. For external use, properly diluted.

*Liquor Sodii Boratis Compositus.*—Dobell's-Solution. Borax and sodium bicarbonate, each, ʒij; carbolic acid, gr. xxiv, in water, Oj. For external use in spray for nose and throat.

*Tri-Brom-Phenol.*—A compound of Bromine with Carbolic Acid. In the form of soft, white needles; used externally as an antiseptic.

*Calcium Carbolatum*—Carbolated Lime. For disinfecting purposes.

**Physiological Action.**—Carbolic acid and its preparations are distinguished by their destructive action upon the lower forms of life, but owing to their tarry smell they cannot be used for preserving food, like boric acid, and are not popular in the household. When applied to the skin, carbolic acid causes irritation, and sometimes sloughing. Gangrene sometimes follows the use of carbolic acid as a surgical dressing. According to the observations of Dr. E. T. Reichert, this result is most apt to be caused by the use of moist application and occurs especially in weak subjects, women and children. According to some reported cases the presence of chronic alcoholism or diabetes seems to favor the occurrence of this accident. Carbolic acid is a local anæsthetic. It is also readily absorbed through the skin, and toxic effects have been produced in this way, although much more frequently by the absorption through the raw surface of a recent wound. Two cases of coma due to the application for a variable time of a 5-per-cent. solution have been reported by R. Clement Lucas and W. Arbuthnot Lane. The urine is diminished in quantity, and on standing acquires an olive-green color; this is generally the earliest symptom of intoxication. We also notice loss of appetite, nausea, vomiting, frothy salivation, difficulty in swallowing, and nervous symptoms. The pupils are contracted and the functions of the brain and spinal cord are affected, suspended reflexes and impaired sensibility and motility being observed. Large doses exert a depressant influence upon the circulation, and after lethal amounts the heart stops in diastole. Death occurs from respiratory paralysis; the temperature is at first increased, but afterward is reduced. In severe cases there is shock, great pallor, and sudden death. At the autopsy the drug may be recognized by its penetrating odor; evidences of corrosive action may be seen if taken in concentrated form, but even in small quantities it produces gastritis. As elimination takes place principally by the urine, the kidneys may be congested or inflamed; the blood is dark and imperfectly coagulated.

According to the observation of Dr. W. J. Wilkinson, the number of red blood-corpuscles is reduced, but the percentage of hæmoglobin remains unaltered. Zwaardemaker has shown that rats and cats are particularly susceptible to the action of carbolic acid. After a poisonous dose death sometimes comes on with great rapidity. In other cases it is delayed for several hours or days. The fatal dose varies within wide limits, the minimum being rather more than a drachm.

**Treatment of Poisoning.**—When carbolic acid has been swallowed prompt treatment is required. The soluble sulphates (soda or magnesia) are the best antidotes, but the liquor calcis saccharatus, or syrup of lime, is also useful, if at hand. Alkalies, soap, albumin, flour and water may be given, and the stomach washed out with the stomach-pump. Oils should not be given, as they favor absorption. The bowels should be freely opened with Epsom salt, to carry off any acid from the intestinal tract. Collapse is relieved by hypodermic injections of atropine, by hot applications, arterial stimulants, and friction. The soluble sulphates should be administered in small doses for several days, in order to remove the carbolic acid from the system.

**Therapy.**—The antizymotic and antiseptic qualities of carbolic acid have been largely utilized in surgery, although it has now been nearly superseded by the solutions of mercury, which have no offensive odor. Formerly the spray of carbolic water was considered an indispensable feature of the Listerian method, but this has been found to be unnecessary and has been abandoned, as asepsis can be secured without it. It is still used, however, as a detergent and as an application upon dressings. In the treatment of carbuncle or malignant pustule, after incision and scraping, the application of pure carbolic acid not only acts as an antiseptic, but also as a local anæsthetic, relieving pain.

Dr. B. F. Gardner, of Bloomsburg, Pa., is in the habit of using undiluted carbolic acid in the treatment of wounds and burns. The tissues turn white immediately after its application and are then cleansed by sterilized water. He claims that he has witnessed from its use in this manner neither shock nor systemic absorption. It also exerts a hæmostatic effect, especially upon the capillary vessels.* The camphophenique being free from offensive odor, may be used as a substitute for the pure acid. In weak solutions carbolic acid has been used as a parasiticide in various forms of tinea; and it has also been used topically for the prevention of pitting from small-pox. An ointment containing carbolic acid and camphor has proved of service also in mitigating the pruritus accompanying variola. In the treatment of burns, in the form especially of carbolized oil, it is much employed. In acute vesicular eczema, erythema, and in dermatitis, especially from various poisonous substances, the writer has employed this combination with great service:—

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* See paper by Dr. Oscar H. Allis, on "Carbolic Acid used in full strength in Surgery," in *Medical Bulletin*, January, 1894, page 4.

| | |
|---|---|
| ℞ Acidi carbolici, | gtt. vj. |
| Pulveris zinci carb. imp., | ℥j. |
| Liq. calcis, | f℥iij. |
| Glycerini, | f℥iij. |

M. Sig.: Shake well, and mop frequently over the surface.

An ointment containing carbolic acid, sulphur, and camphor is most effective in many pruritic diseases of the skin, especially papular eczema, psoriasis, lichen, and urticaria or nettle-rash:—

| | |
|---|---|
| ℞ Acidi carbolici, | gtt. v vel x. |
| Sulphuris subl., | ʒss. |
| Camphoræ, | gr. x. |
| Ungt. zinci oxidi,. | ℥j. |

M. Sig.: Apply frequently to the irritable surface.

Lotions containing carbolic acid also allay the itching which accompanies jaundice.

In the vulvitis or leucorrhœa of young girls lotions or injections of carbolic acid in the strength of 5 parts to 1,000 of water are beneficial, pads of lint saturated in the same solution being used to separate the inflamed parts in the intervals. The gonorrhœa of females has also been successfully managed by the application once or twice a day of tampons moistened with the following mixture:—

| | |
|---|---|
| ℞ Acidi carbolici, | gr. xv. |
| Alcohol. vel sp. odorat., | f℥j. |
| Aquæ, | f℥ijss. |

M.

Scabies has been cured by friction with a 1 to 15 carbolized oil.

A combination of substances possessing antiseptic properties has often been proposed for the purpose of securing increased action, lessened toxicity, greater solubility, etc. Dr. J. de Christmas, of the Pasteur Institute, Paris, has devised a mixture which he terms phenosalyl, the formula of which is as follows:

| | |
|---|---|
| Carbolic acid, | 90 parts. |
| Lactic acid | 20 " |
| Salicylic acid, | 10 " |
| Menthol, | 1 part. |

Phenosalyl is a clear, syrupy liquid and partially crystallizes at low temperatures, but upon the addition of a small quantity of glycerin a clear solution results. This will not again crystallize and readily dissolves in warm water, alcohol and ether. In cold water it is soluble to the extent of 7 per cent. Experiments have shown that phenosalyl is considerably less poisonous than carbolic acid. It has been used in

1-per-cent. solution for the disinfection of hands and instruments, for irrigations, etc. A solution of the same strength proved rapidly curative in a case of impetigo, while 2- to 5-per-cent. phenosalyl pencils were beneficial in endometritis and urethritis. Phenosalyl has been advantageously used as an antiseptic in obstetric cases. A 2-per-cent. solution injected into the bladder was productive of excellent results in purulent cystitis. An ointment of one part of phenosalyl to 100 or 160 parts of vaseline was successfully employed by Dr. Berger in blepharoadenitis and a 0.2- to 0.4-per-cent. aqueous solution in different forms of conjunctivitis.

Internally, carbolic acid sometimes rather unexpectedly produces symptoms of poisoning, which fact restricts its use. In fermentation accompanying flatulent dyspepsia and in dilated stomach, carbolic acid will check the process and relieve the symptoms. It is useful in irritable vomiting, given frequently in broken doses. The author suggests the following prescriptions in the variety of dyspepsia referred to:—

| | |
|---|---|
| ℞ Acidi carbolici, | gtt. iv. |
| Pulv. aromatic., | gr. xij. |

M. et ft. pil. no. xij.
Sig.: One before meals.

| | |
|---|---|
| ℞ Acidi carbolici, | gtt. v. |
| Syrupi acaciæ, | f℥iss. |
| Aquæ cinnamomi, | f℥iss. |

M. Sig.: One teaspoonful before meals.

Carbolic acid is also of service in the treatment of diarrhœa. It has been used in pill form in the treatment of tape-worm. It is part of the so-called specific treatment of typhoid fever in extemporaneous combination with tincture of iodine (1 to 2 of iodine) in doses of gtt. ii-iij every three or four hours, given in mint-water. The acid has been given in typhoid fever unassociated with iodine. Surgeon R. H. Quill, of the British army, has used in typhoid fever a combination of carbolic acid and chloroform, the proportion of acid to spirit of chloroform being as 3 to 10, and gives the most favorable reports of this method. In puerperal septicæmia, alone or alternated with quinine, it has been thought to answer a good purpose. Carbolic acid has been recommended by some writers as a valuable prophylactic against scarlet fever. In offensive breath, the cause may be in the mouth, throat, or bronchi, and in any of these cases the use of the steam-atomizer with a 5-per-cent. solution of carbolic acid will often relieve the patient very promptly. Caries of the teeth may be relieved by a mouth-wash containing carbolic acid or phenol-sodique, well diluted. The same applied with a brush or atomizer has been used in diphtheria and various forms of sore throat. Weak solutions are used in hay fever, chronic nasal catarrh, coryza, and influenza, and afford marked relief; the one known as Dobell's solution is widely used for the purpose, and for cleansing the nostrils previous to making local applications.

Parenchymatous injections of a 2-per-cent. solution have been made for checking the progress of erysipelas, and also into the cavities of the lungs in pulmonary phthisis. In the early stage of furuncle, and in enlarged lymphatic glands, the hypodermic injection of the same solution will often prove effectual in preventing the formation of pus. The same method has been employed with success in the treatment of chronic synovitis, and it has proved of service in certain forms of functional spasm, accompanied by localized pain, the injection being made at the painful spots. Cases of tetanus have been successfully treated by the subcutaneous injection of a 1-per-cent. solution, conjoined with warm baths and enemeta containing chloral and potassium bromide.

Ziemssen recommends in tonsillitis the injection into the substance of the gland of 8 minims of a solution of the strength above indicated. Relief is rapid, often after only a single injection has been made. As a prophylaxis against frequent recurrent attacks of tonsillitis, gargling the throat with a carbolized alcoholic solution has been advised. The pure acid (♏ xv-xx) has been used by Levis as an injection into the tunica vaginalis in cases of hydrocele, with successful results. In hæmorrhoids, carbolic acid, either pure or diluted with oil, has been employed with satisfactory results, but there have been some accidents. It has also been recommended in weak solution for the treatment of ascarides by enema, but the danger of absorption is too great for its use in this way; it may, however, be applied externally, as it is an excellent antipruritic.

The vapor of carbolic acid may be inhaled for whooping-cough or phthisis, in the place of the spray, by placing a few drops upon some absorbent cotton in an inhaler.

Dr. H. Ernest Schmid relies entirely, in every stage of whooping-cough, upon the use of a spray composed as follows:—

| | | |
|---|---|---|
| ℞ | Acidi carbolici, | gr. vj. |
| | Menthol (4-per-cent. sol.), | f ʒ iv. |
| | Cocain. hydrochlor. (3-per-cent. sol.), | f ʒ iij. |
| | Glycerin., | f ʒ j. |
| | Aq. lauro-ceræsi, | q. s. ad f ℥ j. |
| M. | | |

The solution is used by means of an atomizer every third hour, the nozzle of the instrument being directed as far as possible into the mouth of the patient. The use of a weak solution of carbolic acid by atomization, combined with its internal administration, is of service in pulmonary gangrene.

In the septic diseases,—small-pox, septicæmia, puerperal fever, etc.,—the sulpho-carbolates have been used with asserted success. In typhoid fever, Dr. Waugh has had good results from zinc sulphocarbolate, in doses of gr. ii–iij, four or five times a day. It has the advantage, over the carbolic acid and iodine treatment, of being less depressing to the heart and less injurious to the kidneys.

Professor M. Charteris, of Glasgow, believes that pure carbolic acid yields good results in the treatment of typhoid fever. He gives it in the form of a pill containing 2½ grains of pure acid made up with some innocuous powder and covered with keratin, for the purpose of delaying solution until it has passed into the bowel. He is also of the opinion that it may be useful as a prophylactic and therapeutic agent in cholera, and that it might with advantage be tried in diphtheria in doses of 2 grains every two hours.

Magnesium sulphocarbolate is said by Dr. G. Tarozzi to be an efficacious laxative and intestinal antiseptic in doses of 15 to 30 grains.

**Trikresol.**—Crude carbolic acid consists largely of cresols. These compounds are insoluble in water on account of the admixture of other hydrocarbons. When separated from the latter the cresols present themselves in the form of a clear fluid of a pleasant odor. This liquid has been appropriately termed trikresol, as it is a combination of three isomeric modifications, ortho-, meta- and paracresol. It is difficult to separate these bodies from each other on account of the close proximity of their boiling points. Trikresol is slightly soluble in water, its specific gravity at 68° F. varies between 1042 and 1049, and its boiling point is between 365° and 401° F. Professor Charteris found that moderately toxic doses produced in guinea-pigs convulsions of the hind legs, followed by general spasm from which the animal recovered in less than an hour. Large doses immediately gave rise to severe convulsions involving the whole body. From 7 to 8 minims appeared to be a lethal dose for the guinea-pig. Bacteriological experiments demonstrated that trikresol has nearly three times more germicidal power than pure carbolic acid. A 1-per-cent. aqueous solution of trikresol has been found an efficient cleansing application to wounds and an excellent fluid for the disinfection of instruments.

Dr. Robert Lee calls attention to the fact that trikresol when mixed with water in definite proportion will, like carbolic acid, yield on boiling a vapor of definite and constant strength. By virtue of this property the fluid may be beneficially administered by inhalation in many diseased conditions of the upper air passages.

Dr. de Schweinitz makes use of a solution (1 : 1000) of trikresol in distilled water as a solvent in preparing collyria, and has kept such preparations for months without observing any change in them due to bacterial growth. In the above degree of dilution trikresol is harmless to the eyes.

Trikresol has been used as an internal remedy by Dr. Hiller, who found that it may, without inconvenience, be given for several successive days in the daily dose of 24 to 30 grains, enclosed in gelatin capsules, each containing 1½ grains dissolved in olive-oil by means of potash soap.

Following this method of administration Dr. H. Kölsch has reported excellent results from its use in twelve cases of typhoid fever. These were treated by trikresol exclusively. Alleviation of the malady was marked. No complications or relapses occurred and convalescence was rapid. In six of the cases in which trikresol was employed from the earliest days the course of the disease is said to have been shortened.*

**Cresol Saponate.**—By melting pure soft-soap in a dish on a steam bath and mixing it with an equal quantity of clear, crude carbolic acid, heating the solution until it remains clear upon cooling, a wine-colored liquid is produced. Cresol saponate has a specific gravity of 1060, is of neutral reaction and soluble in all proportions in water, alcohol or glycerin. The liquid is possessed of useful antiseptic properties.

**Sodium Paracresotate.**—Paracresotic acid is obtained by combining carbonic acid with paracresol in presence of sodium. It occurs as white, brilliant, acicular crystals, soluble in hot water, ether, alcohol and chloroform. Sodium paracresotate is a fine crystalline powder, of a

* *Medical Bulletin*, November, 1894, p. 420.

bitter but not unpleasant taste, moderately soluble in water. In warm-blooded animals the salt retards the respiratory movements and reduces blood-pressure. It possesses antipyretic and antiseptic virtues. It has been given internally in rheumatism, typhoid fever and the gastro-intestinal catarrh of nursing infants. This substance checks diarrhœa and acts as an intestinal disinfectant. The maximum dose of sodium paracresotate for a child two years of age is 7½ grains daily, for a child 4 years of age 15 grains, and for one 10 years of age 45 grains. The formula according to which Demmé prescribed this remedy in infantile diarrhœa is:—

| | |
|---|---|
| ℞ Sodii paracresotat., | gr. jss–iij. |
| Tr. opii, | gr. ij–iv. |
| Sp. vini Gallici, | ♏xv. |
| Syr. acaciæ, | f℥j ¼. |
| Aq. destillat., | f℥vj. |

M. Sig.: Teaspoonful every two hours.

Beneficial results have also been reported from the use of the soda salt in the treatment of catarrhal pneumonia.

**Kresin.**—This compound contains 25 per cent. of cresol dissolved by means of an equal quantity of sodium cresoxylacetate. Kresin is a brown liquid, with an odor like that of cresol, and forms a clear neutral solution in water. It is said to be less poisonous and less irritant than carbolic acid, half a drachm being given internally to a rabbit without deleterious results. It does not render the hands or instruments slippery, nor does it corrode metals. From ½ to 1-per-cent. solutions are efficient for disinfectant purposes in surgery. Kresin is likewise very useful in the disinfection of rooms, discharges, water-closets and waste-pipes. A 5 and 10-per-cent. kresin soap has been prepared and is adapted to use in various forms of skin disease.

**Chlorphenol.**—This name is given to a liquid obtained by the action of chlorine gas upon carbolic acid. It is a mixture of chlorphenols, and is a dense, volatile fluid of pleasant odor. Chlorphenol is regarded by Passerini as of value in the treatment of pulmonary tuberculosis, chronic bronchitis, bronchorrhœa and gangrene of the lung, ozæna and laryngitis. It is administered by inhalation, the daily dose being from 20 to 30 drops. Chlorphenol has been used as a local application to ulcers, especially those due to tubercular deposit. It exerts a very favorable and rapid effect upon tubercular and chronic simple ulcers of the larynx and naso-pharynx. Good results have also been produced by the use of the same compound in purulent inflammation of the ear and antrum of Highmore. Chlorphenol will presumably have a beneficial action in diphtheria.

**Parachlorphenol** is a solid substance, scarcely soluble in water, but readily soluble in alchohol. It possesses decided antiseptic properties. In the treatment of laryngeal tuberculosis the affected surface is first painted with a weak solution. The strength of the solution may be gradually increased to 50 per cent. After an application there is a slight burning sensation. This, however, soon disappears and gives place to an anæsthesia which continues for several hours. Parachlorphenol is also an advantageous application to enlarged tonsils. It is useful, moreover, in disinfecting tuberculous sputum. Parachlorphenol is likewise of service in otitis media, suppuration of the maxillary sinus, and hypertrophy of the tonsils. This agent was applied in the form of a solution, at first weak and subsequently more concentrated, until it might be employed in the strength of 50 per cent.

Parachlorphenol has been used with advantage by Dr. A. Elsenberg in lupus. After the affected parts had been thoroughly cleaned they were repeatedly painted by a pledget of cotton saturated in a solution of parachlorphenol. An ointment consisting of equal parts of parachlorphenol, lanolin, vaseline and powdered starch was next applied and left in position for ten or twelve hours, when it was replaced by a salicylic acid or iodoform ointment. Parachlorphenol is a less severe dressing than pyrogallic acid, which, according to the writer quoted, it surpasses in efficacy. A local but no general reaction follows the use of parachlorphenol. The effect of the remedy, though not immediately manifested, usually continues for a considerable period. Caution must be observed in using parachlorphenol upon the face, as it is apt to cause conjunctivitis and epiphora.

**Bromphenol.**—This is a fluid of analagous composition to chlorphenol, bromine taking the place of chlorine. Bromphenol is likewise a mixture, is of a purple color and has less of the carbolic acid odor than chlorphenol. Both these substances are freely soluble in water, alcohol and alkaline fluids. Both have given excellent results in the treatment of erysipelas, as reported by Dr. I. Tchourilow, of St. Petersburg. The remedies were used in the form of a 2-per-cent. ointment.

**Aseptol.**—Sozolic acid, or orthophenolsulphonic acid, is obtained by dissolving carbolic acid in concentrated sulphuric acid. Sozolic acid is an amber-yellow or reddish fluid, readily soluble in water, alcohol and glycerin, of a caustic taste and a faint odor of carbolic acid. A solution containing from 30 to 35 per cent. of sozolic acid is commercially known as aseptol. This is a straw-colored and slightly caustic fluid.

**Diaphtherin.**—A combination of aseptol and oxyquinolin is termed diaphtherin and occurs in the form of a bright yellow powder, freely soluble in water and diluted alcohol. As a bactericide it is thought to be superior to carbolic acid and lysol. Diaphtherin is said to be devoid of active toxic property. From one-half to 2-per-cent. solutions have been advantageously used as a dressing to wounds, burns, and ulcers for the purpose of washing out hollow cavities and as a local application in diseases of the nasal mucous membrane. A solution of diaphtherin does not stain the hands, but blackens steel instruments. The discoloration, however, can be easily removed. This body has likewise been used with good effect in inflammatory conditions of the external and middle ear and in eczema of the ear and nose. In eczema a 1-per-cent. solution was employed.

**Diaphthol.**—An analogous chemical compound (orthoquinolin-metasulphonic acid) is termed diaphthol, and though not an energetic antiseptic under its own form, is efficient when transformed into a diaphtholate by being dissolved in an alkaline solution. Diaphtholate of sodium is a clear, yellow fluid, very destructive to micro-organisms. Diaphthol is but slightly toxic, does not give rise to gastric or intestinal irritation and seems well adapted to act as a disinfectant to the digestive and genito-urinary tracts. Diaphthol is eliminated unchanged by the kidneys. Urine in which it is present rarely undergoes ammoniacal fermentation and may be kept for several days without the slightest alteration.

**Steresol.**—This name has been given by Dr. Berlioz, of Grenoble, to an antiseptic varnish of which the formula is as follows:

| | |
|---|---|
| ℞ Pulv. acaciæ, | ℥ viijss. |
| Benzoin., | |
| Balsam. Tolutan., | āā ʒijss. |
| Acid. carbolic cryst., | ℥ iij ¼. |
| Ess. cinnamom., | |
| Saccharin., | āā ʒjss. |
| Alcohol., | q. s. ad Oij. |
| M. | |

Steresol adheres like a varnish to the skin and mucous membrane and has been used with advantage in diphtheria, and tuberculous ulcers of the skin and tongue. The application produces no pain, the layer remains in position for several hours, and it is stated that the carbolic acid does not entirely evaporate from the compound until after an exposure of twenty-four hours.

## **ACIDUM CHROMICUM** (U. S. P.).—**Chromic Acid,** $CrO_3$.

### *Preparation.*

*Potassii Bichromas* (U. S. P.).—Potassium Bichromate. *Dose*, gr. $\frac{1}{10}$–$\frac{1}{5}$

**Pharmacology.**—Chromic acid occurs in the form of small, crimson, needle-shaped crystals, deliquescent and very soluble in water. They should not be added to alcohol, as mutual decomposition takes place, sometimes explosively. An explosion results instantly from a mixture of 1 part of chromic acid with 2 parts of glycerin. For the same reason chromic acid should never be combined with spirit of nitrous ether.

**Physiological Action and Toxicology.**—On account of its marked affinity for water and its contained oxygen, chromic acid rapidly destroys tissues, forming an eschar, and it is a powerful antiseptic. In solution (from 5 to 20 per cent.) it acts as a caustic. When swallowed it is a corrosive poison, and requires prompt treatment by demulcents and alkalies, with irrigation of the stomach. If death does not occur at once from shock it may result from inflammation and sphacelation of the mucous coats of the stomach. Workmen in factories where chromic acid is used are liable to have perforation of the nasal septum from the local action of the acid applied accidentally upon the fingers. Eczema of the hands is liable to occur in those engaged in making the bichromate solution used for dyeing purposes. Cloth dyed with this material is apt to produce ulceration of the integument. The electropoion fluid (*Liquor Electropoiecus*, N. F.), or **battery fluid,** contains potassium bichromate in powder, 6 ounces; commercial sulphuric acid, 6 fluidounces; cold water, 48 fluidounces. Being of an attractive red color, and in such common use among physicians, it may be swallowed by mistake, and instances of poisoning are not uncommon. In such cases, soap-suds and milk may be given at once, and the stomach carefully washed out with a soft tube, as vomiting may rupture the stomach. Arterial stimulants and external counter-irritation and hot applications may be required. Chrome yellow, or lead chromate, has been used by bakers in order to give a rich color to cakes. A number of cases arising from this adulteration have been investigated by Dr. D. D. Stewart, of Philadelphia. Though mentioned here incidentally, the symptoms are principally indicative of lead poisoning.

**Therapy.**—The solution of chromic acid is an excellent remedy for warts, syphilitic mucous patches, and enlarged tonsils (gr. x ad aq. ʒj), applied with cotton or a camel's-hair brush once or twice a day. It has also been used in gynæcological practice in uterine hæmorrhage and endocervicitis, and has been injected into hæmorrhoids, and applied to hypertrophies of the nasal chambers, and also to some malignant growths. Sweating of the feet (hyperidrosis) is relieved by sponging the feet daily with a weak solution. Parasitic skin diseases, sycosis, lupus, tinea circinata, and condylomata, require a stronger solution (gr. c to ℥j). As the caustic action tends to spread, it should be used with caution, covering the neighboring surface with ointment, and promptly removing excess of acid with an alkaline wash.

After the crusts have been removed an ointment composed as follows has proved serviceable in favus:—

| | |
|---|---|
| ℞ Potass. bichromat., . . . . . . . . . | gr. xv. |
| Adipis, . . . . . . . . . . . . . . | ℥j. |

M. ft. ungt.

A 1-per-cent. solution of chromic acid in water has been found by Professor Kaufman, of Alfort, to be an excellent remedy in cases of viper-bites. As an application to chronic ulcers the following combination is recommended:—

| | |
|---|---|
| ℞ Acid. chromic., . . . . . . . . . . | gr. xxx. |
| Acid. tannic., . . . . . . . . . . | gr. xx. |
| Morph. sulph., . . . . . . . . . . | gr. v. |
| Chloral. hydrat., . . . . . . . . . . | ʒvj. |
| Aquæ, . . . . . . . . . . . . | Oj. |

M. Sig.: Apply frequently with camel's-hair brush.

Chromic acid has been successfully used by Dr. W. R. H. Stewart in the treatment of ranula and cystic goitre. After the tumors had been opened, their contents washed out, and after hæmorrhage had ceased, a saturated solution of chromic acid was freely applied to several points of the cyst-wall. Chromic acid is not used internally; but the potassium bichromate has been administered in doses of $\frac{1}{10}$ to $\frac{1}{5}$ grain; it acts as an emetic in doses of $\frac{3}{4}$ grain. It has been used in chronic rheumatism and syphilis made into pill with some vegetable bitter, but is of doubtful utility.

Dr. Joseph H. Hunt, of Brooklyn, praises the action of potassium bichromate as an expectorant in catarrhal conditions of the respiratory tract. To children of a year old he is accustomed to give it in $\frac{1}{20}$ grain doses. When the respiration is seriously embarrassed he repeats the dose every fifteen or thirty minutes until the symptoms are ameliorated, when he diminishes the frequency to hourly intervals.

Following the suggestion of Vulpian, Professor Fraser, of Edinburgh, has, with advantage, made use of potassium bichromate in numerous cases of aggravated dyspepsia,* some of which were associated with distinctive symptoms of gastric ulcer. The remedy was generally given in the dose of $\frac{1}{12}$ grain, sometimes increased to $\frac{1}{6}$ grain, three times a day. Professor Fraser advises that the remedy be given during fasting, while the stomach is, as far as possible, empty. He states that potassium bichromate is capable of relieving, and often in a short time of removing, the entire group of symptoms, except constipation and anæmia, encountered in dyspepsia. It is particularly useful in alleviating pain, nausea and vomiting. In gastric ulcer it did not succeed in checking hæmorrhage.

Potassium bichromate has likewise been administered with asserted benefit in locomotor ataxia. Dr. Diago reports very favorable results from the exclusive administration of this remedy in seven cases of hæmatochyluria, three of which depended upon the presence of filariæ. It was given in the dose of $\frac{1}{3}$ to $\frac{1}{2}$ grain in half a pint of water. He regards the salt as of value in the treatment of pernicious malarial anæmia. In cases of poisoning by potassium bichromate the same means are employed as in chromic-acid poisoning.

### **ACIDUM CITRICUM** (U. S. P.).—**Citric Acid.**

**Dose,** gr. x-ʒss.

*Preparation.*

*Syrupus Acidi Citrici* (U. S. P.).—10 per cent. *Dose,* fʒij–f℥j.

**Pharmacology.**—Citric acid is obtained from lemon- or lime-juice; it occurs in the form of colorless crystals soluble in less than their own weight of water. Citric acid is soluble likewise in alcohol and ether. It is not infrequently adulterated with tartaric acid, which may be separated in the form of bitartrate by the addition of a strong neutral solution of carbonate of potassium. It has a sour taste, not unpleasant in weak solutions. In substance it is irritating to the gastro-intestinal mucous membrane, and may thus act as a poison. It renders the urine acid. It is eliminated to some extent by the bowels, but principally by the kidneys.

**Therapy.**—In the proportion of 570 grains to 1 pint of distilled water it forms a solution of the average acidity of lemon-juice, which may be further diluted and sweetened as a refrigerant drink for fever. It has been used also as a substitute for fresh lemon-juice in the treatment of scurvy, but is less efficient.

Citric acid has likewise been employed for the purpose of relieving inactivity of the liver and catarrhal jaundice. A 1-per-cent. aqueous solution of citric acid is said to be useful as an injection in gonorrhœa.

Citric acid has the power of sterilizing polluted water.

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* *Lancet*, April 14, 1894.

**ACIDUM GALLICUM** (U. S. P.).—**Gallic Acid.**

**Dose,** gr. ii–x.

**Pharmacology.**—Galls are lumps or nodes upon the oak-tree, caused by insects. According to the pharmacopœial definition, gallæ are "excrescences on Quercus lusitanica, var. infectoria, caused by the punctures and deposited ova of Cynips gallæ tinctoriæ," an insect of the order Hymenoptera. They contain about 50 per cent. of tannic acid, which chemically is an anhydride of gallic acid, and, in fact, is convertible into gallic acid by immersion in water. The dose is from 5 to 10 or 20 grains. It is an antidote to antimony or tartar emetic. Its solutions strike a black color in the presence of iron, and they should not be prescribed in combination with chalybeates.

**Therapy.**—Gallic acid is in the form of long needles, nearly colorless, slightly acid, though less astringent than tannin; it is soluble in 100 parts of cold water, 4½ parts of alcohol, or 3 parts of boiled water. Like tannin, it has the effect of restraining secretion, reducing swelling, and hardening tissues. It is eliminated by the kidneys under its own form. In the form of the glycerite (ʒj to ℥j of glycerin) it forms a favorite application to sore throat or tonsillitis; and the ointment of gallic acid is a good application to hæmorrhoids, being an improvement upon the ointment made of powdered galls. The alcoholic solution is useful as a local application to the membranes in diphtheria.

Internally, gallic acid is given in hæmorrhage (gr. xx at a dose) from the alimentary canal, kidneys, or lungs; also in menorrhagia, but here it is inferior to ergot.

In hæmoptysis, ulcer of the stomach, hæmorrhage from the bowel, especially in typhoid fever, the following formulæ can be used:—

| | | |
|---|---|---|
| ℞ | Acid. gallic., | ʒij. |
| | Acid. sulphuric. arom., | fʒj. |
| | Morphinæ sulph., | gr. j. |
| | Tinct. cardamom. co., | f℥j. |
| | Aquæ rosæ, | f℥ij. |

M. Sig.: One teaspoonful in water every hour or two.

| | | |
|---|---|---|
| ℞ | Acid. gallic., | ʒij. |
| | Glycerini, | f℥iij. |

M. Sig.: One teaspoonful every half hour or hour until relieved.

It has also been used to reduce the quantity of albumin in the form of chronic renal disease commonly called Bright's disease.

On account of its astringent effects gallic acid is useful in a number of disorders attended by excessive secretion or transudation, as chronic bronchitis, cystitis, chronic diarrhœa, dysentery, and the night-sweats of phthisis. It is likewise serviceable in purpura hæmorrhagica. It retards the progress of pyelitis or pyelo-nephritis, and diminishes suppuration. Combined with opium, it has been found beneficial in diabetes insipidus.

Pyrogallic acid is obtained from gallic acid by heat; it is used externally in the treatment of acne, but has the disadvantage of discoloring the skin.

**Gallanol.**—This substance, isolated in a state of purity by M. M. Cazeneuve and Rollet, is the anilide of gallic acid. It is possessed of decided bactericidal properties. It has been used with advantage in psoriasis as a powder, mixed with talc, as an ointment in the proportion of 1 to 30, 1 to 10, or 1 to 4 of excipient, or as a 10-per-cent. alcoholic solution. In chronic eczema the application of a 10- to 25-per-cent. ointment relieves pruritus and promotes cure.

Gallanol has likewise been used with good effect in parasitic diseases of the skin, as favus and trichophytosis. A mixture which has given satisfaction consists of 10 parts of gallanol, 1 part of ammonia and 50 parts of alcohol.

**Gallicine,** the methylic ether of gallic acid, a white crystalline substance, soluble in water, has been used with reported success by Dr. Mellinger, of Basle, in conjunctivitis and superficial keratitis and in eczema of the eyelids. It was applied in finely powdered form by means of a brush.

### ACIDUM HYDRIODICUM.—Hydriodic Acid.

**Pharmacology.**—Hydriodic acid is a gas prepared by the action of iodine upon phosphorus in the presence of water, with the aid of gentle heat. It is colorless, but produces white fumes in air; it can be liquefied or even rendered solid by strong pressure and a low temperature. A solution of hydriodic acid in water, if exposed to the air, soon becomes discolored, and after a time deposits crystals of iodine. The solution is not official, but the United States Pharmacopœia recognizes a

**Syrupus Acidi Hydriodici** (U. S. P.), Syrup of Hydriodic Acid, which contains about 1 per cent. by weight of absolute acid; the dose being from 30 minims to half an ounce.

**Therapy.**—The syrup of hydriodic acid* is a valuable means of introducing iodine into the system. When administered in this way the iodine is liberated in the body and is peculiarly active in the nascent form, and especially adapted for administration to scrofulous subjects and cases of catarrhal pneumonia of the chronic type. In some skin diseases of the same character the syrup of hydriodic acid, when carefully made, has proved of great value. It is very efficacious in spasmodic asthma, especially of that variety which is linked with the gouty diathesis.

The syrup of hydriodic acid is an efficient remedy in tertiary syphilis, acute and chronic rheumatism, lumbago, rheumatoid arthritis, chronic lead poisoning, bronchitis, exophthalmic goitre and other affections in which iodine is indicated.

### ACIDUM HYDROBROMICUM DILUTUM (U. S. P.).—Diluted Hydrobromic Acid.

**Dose,** ♏x–fʒiv.

**Pharmacology.**—Hydrobromic acid resembles hydrochloric acid in being official only in solution, each being a gaseous substance. Diluted hydrobromic acid contains 10 per cent. of absolute hydrobromic acid. It is a clear, colorless solution with an acid taste, and can be given in lemon-syrup or simple elixir.

**Therapy.**—Hydrobromic acid should be an excellent antiseptic for dressing wounds, being sedative, non-poisonous, and bactericide in its action. It was introduced as a substitute for the bromides, but it has not fulfilled the expectations of its projectors, although it has some anodyne and hypnotic effects. It is more pleasant to take than the bromides, is less apt to produce an eruption or physical depression, but it is more irritant to the stomach, and in some cases of nervous cough, neuralgia, headache, and nervousness it has a good effect, but is ordinarily given in too small doses. Its action in epilepsy may be compared to that of the bromides, but the gastric irritability which it excites is a bar to its continued use. De Schweinitz has found it useful in headache due to eye-strain. In cases of annoying tinnitus after taking quinine it is said to give prompt relief, although it often fails in relieving tinnitus from other causes. Two fluidrachms are equivalent to 18 grains of potassium bromide.

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* "Hydriodic Acid," by the author, in *Medical Bulletin* for August, 1889.

To relieve irritative cough in phthisis:—

℞ Codeinæ, . . . . . . . . . . . gr. j.
Acidi hydrobromici dil., . . . . . . . . f℥j.
Syr. aurantii, . . . . . . . . . . f℥ij.
M. et ft. mistura. *Dose*, fʒi–ij.

**ACIDUM HYDROCHLORICUM** (U. S. P.).—**Hydrochloric Acid**, formerly **Muriatic Acid.**

*Preparation.*

*Acidum Hydrochloricum Dilutum* (U. S. P.).—Diluted Hydrochloric Acid. *Dose*, ♏x-xxx.

**Pharmacology.**—The official hydrochlorates are of apomorphine, morphine, pilocarpine, and quinine. Aqua chlori is also official. Hydrochloric acid is an irritating, irrespirable gas. The solutions are clear, colorless, and decidedly acid. When applied to the skin they are antiseptic and astringent; in some persons with delicate skin hydrochloric acid is irritating and slightly caustic.

**Physiological Action and Toxicology.**—When taken internally in poisonous doses, it acts as a violent irritant, causing burning pain, a strong acid taste in the mouth, red and swollen tongue, and discoloration of the lips. Vomiting occurs at once, and may be accompanied by bleeding. The patient is at first feverish, but soon falls into collapse and dies of shock or exhaustion. Violent gastric inflammation is found after death, and the œsophagus and mouth show the effects of a corrosive poison. The vapor of ammonia escaping near the vomited matters produces a white cloud of ammonium chloride. The treatment is the same as for other corrosive mineral acids,—demulcent drinks, flour or soap and water, milk, oil, or eggs. The carbonates may be given cautiously, for fear of rupturing the stomach by the escaping carbonic-acid gas. The stomach being softened by the acid, it should be evacuated by the tube rather than by emetics, if vomiting does not occur spontaneously. There is, moreover, danger that in the act of vomiting a portion of the acid may find its way into the air-passages and thus still further extend the mischief. Subsequently, the patient must be treated for the resulting lesions, which are not limited to the intestinal tract, since congestions of the kidneys and lungs may also occur. Medicinal doses stimulate the appetite and promote digestion.

**Therapy.**—Topically, hydrochloric acid is applied to septic wounds, dissecting wounds, or bites of rabid animals. It has also been used, mixed with an equal proportion of honey, as an application to the throat in diphtheria. It is important that this application should be made only to the diseased surface. It is a good addition to baths in cases of skin disease, as pityriasis versicolor or tinea, and in full strength it is used to destroy warts on the hands of children.

Dr. Morris, of New York, has, in some cases, utilized hydrochloric acid for the removal of carious and necrotic bone. Through a sinus or incision a 2- or 3-per-cent. solution of hydrochloric acid in distilled water is injected every two hours or at bedtime, according to the circumstances of the case. The exposed portion of bone is rapidly decalcified, after which there is injected every second day an acid-pepsin solution made by adding 16 minims of hydrochloric acid and $\frac{1}{2}$ drachm of pepsin to 4 ounces of distilled water. The decalcified bone with caseous or fatty material is digested out within a few hours, leaving exposed clean dead bone, which can be attacked in the same manner.

When hydrochloric acid is given well diluted it is acceptable to the stomach, being one of the constituents of the gastric juice. When fermentation of the food takes place, causing flatulence or "windy dyspepsia," it may be due to a deficiency of this element. At all events, cases of weak digestion and dyspepsia are sometimes much benefited by 10 or 20 drops of the diluted acid with half the quantity of tincture of nux vomica, after each meal. Where acid stomach is caused by the presence of bacteria, the antiseptic action is best obtained by administering the hydrochloric acid when the stomach is empty, shortly before eating. It is also held that the excessive secretion of hydrochloric acid (which forms one variety of acid stomach) may be prevented by administering an acid solution just before eating, on the rule that acids check acid secretions. Hydrochloric acid sometimes affords great relief in nausea. In intestinal indigestion with diarrhœa, this agent is also very effective, given one or two hours after meals. The temporary administration of pepsin in combination with the acid is of great value in cases of this kind, but the pepsin should not be continued too long, or the peptic glands may lose their functions.

A good mixture which is very beneficial is:—

| | | |
|---|---|---|
| ℞ | Acid. hydrochlor. dil., | fʒiv. |
| | Pepsin. pur., | ʒiv. |
| | Glycerini, | f℥iij. |

M. Sig.: One teaspoonful in water after meals.

In fevers, where the secretions are very much diminished and hydrochloric acid is not secreted, its administration is of great service in assisting digestion and preventing the development of micro-organisms. In typhoid fever this is the most common treatment (gtt. x–xx, every three hours), and it exercises an important influence upon the contents of the bowels, being slightly astringent and preventing the multiplication of bacilli. Relapse is less frequent under this treatment because auto-infection is less likely to occur. In other infectious zymotic diseases, as scarlet fever, small-pox or diphtheria, hydrochloric acid may be administered in the same way.

It is serviceably combined with the tincture of iron in the treatment of diphtheria, and the mixture may be used both internally and as a local application. The presence of a mineral acid has been shown to diminish the virulence of the toxines of diphtheria.

In phthisis it is serviceable in disinfecting to some extent the alimentary canal, checking excessive sweating, or watery discharges from the bowels, and promoting constructive metamorphosis.

A very beneficial combination for phthisis will be :—

| | |
|---|---|
| ℞ Acid. hydrochlor. dil., | ♏cc. |
| Tinct. nucis vomicæ, | ♏cc. |
| Tinct. capsici, | fʒj. |
| Tinct. cinchonæ, | f℥v. |

M. Sig. : Two teaspoonfuls in water after meals.

The formerly official liquor pepsini contained saccharated pepsin, 40 parts ; hydrochloric acid, 12 parts ; glycerin, 400 parts ; and water to make 1000 parts. The usual dose is a tablespoonful after eating.

Chlorine, for bleaching or disinfecting purposes, can be obtained by pouring hydrochloric acid upon manganese binoxide. It is a greenish-colored, intensely irritating gas. (See Aqua Chlori.)

**ACIDUM HYDROCYANICUM DILUTUM** (U. S. P.).—**Diluted Hydrocyanic Acid,** sometimes called **Prussic Acid.**

**Dose,** ♏i–v.

**Pharmacology.**—A liquid composed of 2 per cent. of absolute hydrocyanic acid and 98 per cent. of alcohol and water. It is colorless, faintly acid, with taste and odor of peach-kernels, rapidly loses the volatile acid when exposed to the air and light, and deteriorates if kept too long ; so that the dose is variable. The usual dose is from 1 to 5 minims, but we should always commence with the minimum dose and cautiously increase, because of the different degrees of activity of this preparation. Cherry-laurel water (Aqua laurocerasi) is official in European pharmacopœias, but not in ours ; it is also of very variable strength, but is used in somewhat larger doses (♏v–xx). The cyanides of mercury, potassium, and silver are official. By the addition of an acid to any of these salts, it will be decomposed and hydrocyanic acid set free, as in the following prescription :—

| | |
|---|---|
| ℞ Potassii cyanidum, | gr. j. |
| Acid. citric., | gr. v. |
| Syr. tolutani, | f℥ii vel iij. |

M. Sig.: A teaspoonful as a dose for an irritable cough.

**Physiological Action and Toxicology.**—Hydrocyanic acid is very poisonous as a gas, and even in the ordinary solution, in sufficient quantities to cause death, it is almost immediately fatal. In cases where it does not cause death at once, there is great prostration of bodily powers ; weak, fluttering pulse ; cold extremities, and impending collapse. Atropine, hypodermatically, is the physiological antidote.

According to Dr. Johann Antal, cobalt nitrate is an efficacious chemical antidote, but no time should be lost before emptying the stomach with the aid of stimulating emetics. Cold affusions to the spine, with frictions and sinapisms to the surface, and hot applications are also efficient. The peculiar bitter-almond odor of the ejecta indicates the character of the poison. Death generally occurs by suffocation from paralysis of respiration. Elimination, as well as absorption, of hydrocyanic acid is very rapid. Ringer states that if life can be supported for half an hour recovery will usually occur.

Locally, hydrocyanic acid at first slightly irritates the skin, but afterward acts as a sedative. It should not be used in skin diseases when the skin is broken, for fear of absorption. It has some action upon the brain, causing vertigo and hebetude; the respiratory centre is enfeebled and the motor nerves paralyzed, producing great muscular feebleness. The conducting power of the sensory nerves is diminished. It is a decided cardiac sedative, the pulse becoming slow, with lowered arterial tension. The poison also acts upon the respiratory function of the red blood-corpuscles, and prevents them from carrying sufficient oxygen to the tissues.

**Therapy.**—Hydrocyanic acid has been used as an antispasmodic in various forms of reflex vomiting, such as the vomiting of pregnancy and that of phthisis. It has also been employed in nervous cough, in irritable heart, and asthma. Whooping-cough, acute mania, and melancholia may also be relieved by the administration of hydrocyanic acid. As it is rapidly eliminated from the system, the dose should be repeated at short intervals. Its sedative effect upon the gastric mucous membrane renders it valuable in painful affections of that organ, such as gastralgia, ulcer, and cancer. The same benefit is obtained from its use in enteralgia. For external use it may be added to rose-water (ʒii–℥viij) with a little glycerin, to be applied in cases of troublesome pruritus.

### ACIDUM HYDROFLUORICUM.—Hydrofluoric Acid.

This is also an irrespirable gas, but is dispensed in solution with distilled water (1 to 200), and administered in doses of 10 to 20 minims. The gas has the power of acting upon glass, and the solution must be kept in rubber bottles.

Under the theory that this gas would exert a destructive influence on the bacilli, hydrofluoric acid has been tried in phthisis, but the results have not supported the theory. The fluorides of ammonia and iron have been also tried in medicine, but with no better result.

### ACIDUM LACTICUM (U. S. P.).—Lactic Acid.

**Dose,** ♏xx–ʒss.

*Preparation.*

*Ferri lactas* (U. S. P.).—Ferrous Lactate. *Dose*, gr. ii–v.

**Pharmacology.**—A colorless, odorless, syrupy liquid, with an acid taste, containing 75 per cent. of lactic acid and 25 per cent. of water. On account of carelessness in manufacture it may contain hydrochloric, sulphuric, or sarcolactic acid and traces of metallic impurities. It is soluble in water and alcoholic solutions. The ordinary dose is from twenty minims to a half a drachm, diluted and sweetened.

**Physiological Action.**—Lactic acid is present in the stomach during the digestion of carbohydrates, especially during the first stage of gastric digestion. When in excess, it forms one variety of sour stomach, and causes pain in different parts of the body, headache, etc. It has been asserted that rheumatism is due to an excess of this acid in the system, and the fact that rheumatoid symptoms sometimes develop after partaking of sour milk or lactic acid seems to lend support to this view. Such patients are benefited by the use of alkaline treatment. Large amounts act as depressors to the nervous system and decrease the normal alkalinity of the blood, thus favoring myalgic and neuralgic attacks.

**Therapy.**—Locally, lactic acid, diluted ($\frac{4}{5}$) with water and glycerin, has been used in tuberculosis of the throat and larynx and in diphtheria and croup as a solvent of false membrane. In lupus or tubercular ulceration of the tongue it has been found very useful, as well as in lupus of the face, diluted (15 to 30 per cent.).

A solution of lactic acid varying in strength from 10 to 30 per cent. is also a beneficial application to many laryngeal tumors. In a 20- to 40-per-cent. solution it has been employed with good result in suppurative otitis and ulcers of the nasal fossæ. Mosetig-Moorhof has used concentrated lactic acid locally in caries, lupus and epithelioma.

In the external lesions of tuberculosis, Dr. Zippel, of Hamburg, prefers the application of gauze tampons soaked in lactic acid. In the treatment of tuberculous fistulæ the same writer recommends the introduction of rods composed of a paste made by gently heating 50 grammes (1½ ounce) each of gelatine, lactic acid and water and then adding 30 grammes (1 ounce) of menthol. The rods made of the congealed paste are covered with a layer of collodion.

In dyspepsia, with deficient secretion, pepsin may be combined with lactic acid at meal-time. Lactic acid is of utility in lithæmia and phosphaturia. In the green diarrhœa of infancy, attributed by Hayem to a microbe, this agent well diluted (ʒj in a tumblerful of recently-boiled water, sweetened with white sugar, of which solution a teaspoonful may be given every half hour or hour, according to the case) is a very efficient remedy, controlling irritability of the stomach, relieving pain, and changing the character of the discharges. It has been shown, however, that some of these cases are due to a specific microbe, while others depend upon hepatic disorder. In the latter class of cases the remedy is of no effect. Lactic acid is also of value in the vomiting of new-born babes caused by indigestion. It is likewise useful in the diarrhœa of typhoid fever, intestinal catarrh and intestinal tuberculosis. Dr. N. V. Lojkin regards lactic acid as of great value in the treatment of chronic dysentery.

From theoretical considerations the use of lactic acid in diabetes mellitus was proposed by Cantani. Cases have been reported in which, conjoined with appropriate dietetic regimen, it appeared to favorably influence the disease and lessen the quantity of sugar excreted. In other cases, again, it proved a failure.

Dr. Foucaut, of Orleans, suggests the use of lactic acid as a prophylactic in gout. He gives 1 drachm a day for three weeks, or a month, when the remedy is discontinued for ten or eleven days, after which it is resumed in the same manner. It is said to reduce the number of attacks and to render them less painful.

The ammoniacal decomposition of the urine which takes place in chronic cystitis is checked by the administration of this remedy.

Ferrous lactate is in the form of greenish crystalline scales or crusts, and is used as a chalybeate tonic, being less astringent and constipating than other iron salts.

### ACIDUM NITRICUM (U. S. P.).—Nitric Acid.

*Preparation.*

*Acidum Nitricum Dilutum* (U. S. P.).—Diluted Nitric Acid. *Dose,* ♏v-xx.

**Pharmacology.**—Nitric acid contains 68 per cent., by weight, of absolute nitric acid and 32 per cent. of water. The diluted acid contains 10 per cent. of absolute acid.

Ammonium, lead, potassium, silver, and sodium nitrates are official; also spirit of nitrous ether, bismuth subnitrate, nitrohydrochloric acid, and diluted nitrohydrochloric acid. The solutions of ferric and of mercuric nitrate are official.

**Physiological Action and Toxicology.**—Diluted nitric acid when applied to the skin produces a yellowish discoloration. Stronger applications occasion a bullous eruption resembling pemphigus and have been known to be employed by hysterical women for the purpose of deception. Introduced in a concentrated solution, nitric acid is a violent corrosive poison, and produces vomiting, pain, and distress, at once, followed by inflammation and sloughing of the mucous membrane of mouth and œsophagus. Alkalies, demulcents, and milk diet constitute the treatment. Fatal accidents occasionally happen from inhaling the fumes of nitric or other mineral acid. In small doses nitric acid stimulates the intestinal glands.

When its use has been too long continued nitric acid causes salivation, spongy and bleeding gums with loosening of the teeth, foulness of the breath, dyspepsia, colic, headache and debility. These untoward effects soon disappear when the remedy is suspended.

**Therapy.**—Nitric acid is an oxidizing agent in the laboratory, and when applied in strong solution it has a decidedly caustic action, staining the skin yellow. It is the preferred caustic for venereal sores, warts, poisoned wounds, sloughing, and phagedæna. In uterine ulceration, prolapse of bowel, and hæmorrhoids, nitric acid is a useful application. Nitric acid has been successfully employed in the form of a lotion or foot-bath in the treatment of chilblains. Introduced into the system in small doses, well diluted, it acts as an astringent tonic, especially useful in cases of atonic dyspepsia, and in the uric-acid diathesis and oxaluria. Small doses of nitric acid are serviceable in stomatitis. In broken-down syphilitic subjects, or in chronic liver disease, nitric acid is a useful restorative.

A very valuable prescription, especially for the treatment of chronic syphilis, is as follows:—

| | |
|---|---|
| ℞ Acidi nitrici dil., | ♏cc. |
| Tinct. bardanæ sem., | f℥iij. |
| Tinct. xanthoxyli, | f℥ij. |

M. Sig.: Two teaspoonfuls in water three times a day.

In dilute solution (♏x or xx–ʒj) it has been used in cases of phosphatic calculi, to wash out the bladder, and it may be used as an injection into sinuses connected with dead bone. A few drops of nitric acid to the ounce of water is an excellent stimulant application to indolent ulcers. In whooping-cough, or bronchial catarrh, it has been advocated, and in hoarseness of public speakers a few drops in a glass of water afford relief. It is inadvisable to continue too long the administration of nitric acid, as, in that case, it excites gastro-intestinal catarrh. The same remark applies to the other mineral acids.

In many skin diseases, such as impetigo, lepra, acne, the addition of nitric acid to the bath has been found useful in addition to its internal administration.

**Mistura Antidysenterica.**—Hope's camphor mixture:

| | |
|---|---|
| ℞ Acidi nitrici,* | fʒss. |
| Tincturæ opii, | ♏xx. |
| Aquæ camphoræ, | f℥iv. |

M. Dose, a teaspoonful to a tablespoonful every hour or two, according to symptoms.

Diluted nitric acid will often remove chronic diarrhœa, and its efficacy may be increased by the addition of witch-hazel, thus:

| | |
|---|---|
| ℞ Acidi nitrici dil., | ♏clx. |
| Ext. hamamelidis fl., | fʒiij. |
| Syrup. aurantii, | f℥iv. |

M. Sig.: From one to two teaspoonfuls in water three or four times a day.

In the daily dose of 1 to 4 drachms nitric acid has sometimes proved successful in diabetes insipidus, and it is said to allay the thirst of saccharine diabetes.

Full doses of nitric acid every fourth or sixth hour have been found useful in intermittent fever. After the paroxysm has been broken up by quinine, nitric acid may be serviceably given in order to relieve inactivity of the liver and intestinal glands. Small doses of nitric acid are beneficial in aphthæ and ulcerative stomatitis.

Nitric acid reddens morphine, and probably decomposes it; and, therefore, should not be prescribed in solutions with this agent, as the rule. The nitrites have a decided lowering influence upon the temperature and circulation; they will be considered in connection with amyl nitrite.

## ACIDUM NITROHYDROCHLORICUM (U. S. P.).—Nitrohydrochloric Acid.

### *Preparation.*

*Acidum Nitrohydrochloricum Dilutum* (U. S. P.).—Diluted Nitrohydrochloric Acid. *Dose,* ♏v–xx.

**Pharmacology and Therapy.**—This combination of nitric and hydrochloric acids is official, the diluted form containing 4 parts of nitric acid, 18 of hydrochloric acid, and 78 parts of distilled water. It should be allowed to stand for two weeks after mixing, and kept in a cool place. The concentrated solution readily dissolves gold leaf when immersed in it; it is not used for medical purposes, the diluted form being preferable. It is supposed to have a special action upon the hepatic functions, and is a good tonic and astringent. It has been applied with compresses in chronic liver disorders in a solution (f℥ss to a pint of water).

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* The original formula for this preparation called for nitrous acid, but as commercial nitric acid usually contains some nitrous, it has become customary to order nitric acid.

Internally, nitro-hydrochloric acid is given with advantage in torpidity of the liver, the chronic hepatitis of the tropics, and in the early stage of hepatic cirrhosis. It is of service in chronic diarrhœa and dysenteric diarrhœa. This acid has been occasionally known to produce salivation.

Symptoms of poisoning and methods of treatment same as given under Hydrochloric Acid.

## **ACIDUM OLEICUM** (U. S. P.).—**Oleic Acid.**

### *Preparations.*

*Oleatum Hydrargyri* (U. S. P.).—Oleate of Mercury, 20 per cent.
*Oleatum Veratrinæ* (U. S. P.).—Oleate of Veratrine, 2 per cent.
*Oleatum Zinci* (U. S. P.).—Oleate of Zinc, 5 per cent.

**Pharmacology.**—Oleic acid is an oily, yellowish, tasteless liquid, gradually becoming brown, rancid and acid when exposed to the air. It is insoluble in water, but soluble in alcohol, ether, etc. Equal volumes of the acid and of alcohol, heated to 77° F., should give a clear solution, without allowing the appearance of free drops of oil upon the surface.

This, when freshly prepared, is a bland and unirritating application to the skin, and was brought forward as an addition to ointments and liniments to increase their penetrating power, but lanolin has now taken its place for this purpose. Lately, largely through the influence of the writings of the author, it has been much used in the manufacture of oleates, which are now produced in the form of true chemical compounds, instead of simple mixtures, as heretofore.

The following is a summary of the action of the oleates, from "Ointments and Oleates, especially in Diseases of the Skin"*:—

### *The Oleates.*

*Aconitine Oleate.*—Not very active. Can be used in neuralgia.

*Atropine Oleate.*—Not very active. Constitutional effects not produced except where large surfaces are anointed.

*Aluminum Oleate.*—Diluted one-half with lard or some fatty substance, it forms the ointment of the oleate of aluminum, which is decidedly astringent. It is useful in checking the muco-purulent discharges of dermatitis and eczema, and in chafing, or intertrigo, especially in infants and young children. In hyperidrosis and in bromidrosis it is very effective. This ointment is also a useful dressing to burns, foul ulcers, chilblains, and sinuses.

*Arsenum Oleate.*—A valuable alterative and escharotic, but it must be used with caution. The oleate, when melted with lard or ointment base (1 to 4 or 1 to 9), forms the ointment of arsenum oleate. This has little action upon a healthy skin, but when the epidermis has been removed, or on granulating surfaces, it produces inflammation and destroys the vitality of the tissues to a considerable depth. When well diluted, it exerts a most excellent alterative impression upon the

* Second Edition. Philadelphia and London: F. A. Davis, Publisher. Physicians' and Students' Ready-Reference Series. 1890.

integument; and also in ulcerating epithelioma, in lupus (after scraping), and in old scrofulous ulcers, this is of great utility. In sycosis, seborrhœa, and chronic eczema it is likewise of service. After scraping or puncturing the affected area, it can be used to destroy warts, corns, horns, condylomata, old granulations, and nævi. It may be advantageously combined with opium, belladonna, hyoscyamus, arnica, arrow-root, napththol, etc. (For formulæ, see author's book on "Oleates.")

*Bismuth Oleate.*—Emollient and slightly astringent. In all pustular eruptions, in sycosis, it relieves the itching and often aborts the pustules. It allays irritation in erysipelas and sunburn. In acne rosacea, it relieves the inflammation, and, in conjunction with scarification of the surface, is curative. In acute eczema, this oleate is considered indispensable in arresting the progress of the malady. Cracked and sore nipples are usually healed by the oleate of bismuth ointment ( ʒj bismuth oleate to ʒvij of ung. aquæ rosæ).

*Cadmium Oleate* is stimulating and irritating. It has been used in chronic eczema with great infiltration, exuberant granulations, and enlarged glands, the strength of the ointment being adapted to each case.

*Cocaine Oleate*, in the form of a 6-per-cent. alkaloid, with equal parts of ointment or lanolin, has not answered expectations as a local anodyne or anæsthetic, but has been used with some benefit in pruritus pudendi and ani, or eczema marginatum.

*Copper Oleate*, in the form of 10- or 20-per-cent. ointment, has no visible effect upon the healthy skin, but penetrates deeply into the follicles, where it exerts a stimulating and antiseptic action. It is decidedly astringent to the broken skin or raw surface, reducing exuberant granulations, checking hæmorrhage, from irritable sores and old ulcers. Owing to its parasiticide action, it is the best remedy for the various forms of ringworm. In tinea versicolor, even in favus, it is equally effective in destroying the parasite without epilation. Copper oleate, melted and spread as a plaster, will very often cure warts, corns, bunions, and thickened conditions of the epidermis. The ointment above referred to is also useful in freckles and other discolorations of the skin. It is essential that the salt should be made from pure oleic acid, as otherwise the application may be accompanied by irritation or inflammation of the skin. The weaker ointment (gr. v–x to ℥j) should be first tried and the strength gradually increased.

*Iron Oleate* is a valuable styptic and astringent. The use of a weak ointment in the inflammatory form of eczema, in which the surface is raw and bleeding, is followed by good results; also in pustular eczema, sycosis, furuncles, and in scrofulous sores. Mixed with the oil of ergot or any bland oil, the iron oleate is of great advantage in dry seborrhœa and in patches of alopecia. The early stages of acne rosacea are often entirely relieved by the weak application of ointment of iron oleate. In ulcers caused by arsenical poisoning, this has given better results than any other remedy in the hands of the writer, especially with the addition of 1 per cent. of carbolic acid.

*Lead Oleate*, melted with equal parts of lard-oil, or lard, forms a cream-colored, semi-solid ointment, which is superior to Goulard's cerate or Hebra's litharge ointment. It allays irritation in papular or pustular eczema, and also in fissured eczema of the hands or feet. In hard and indurated papules, as in acne of the face, neck, and back, it is excellent in its effects. Thymol, naphthol, carbolic acid, oil of chamomile, or oil of cade may be combined with it, according to the case.

*Manganese Oleate* has been used (a 10- to 20-per-cent. solution in ointment) as a remedy in amenorrhœa and other uterine affections, applied with friction to the abdomen. Probably its asserted good effects are to be attributed to the massage rather than to any constitutional effect from the manganese, as there is no evidence of its absorption.

*Mercuric Oleate* (U. S. P.).—The ointment of mercuric oleate* is a yellowish substance of fatty consistence. It is stimulating to the skin, and has a decided alterant action upon the glandular structures. In old eczema, with thickening of the skin, this twofold action is very beneficial; also in papular and tubercular lesions, and infiltration attendant upon abscesses. In inflammation of the hair-follicles, sycosis, and scrofulodermata, it is quickly curative. Its bactericide action makes it valuable in all cases of parasitic invasion of the skin; and, in the treatment of lousiness, the addition of picrotoxin (gr. i–ʒj) is advisable, in order to destroy the vitality of the nits. If it is desired to produce a constitutional impression, lanolin may be added, or mercurous oleate substituted. In fact, mercuric oleate is absorbed only very slowly. Large quantities have been applied to the surface without producing constitutional effects.

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* Oleatum hydrargyri of the U. S. Pharmacopœia contains 20 per cent. of yellow mercuric oxide, with 80 per cent. of oleic acid.

*Mercurous Oleate.*—This ointment contains a higher percentage of mercury than the preceding (41.6 per cent.); it is substituted when it is desired to make a more profound impression upon the structures of the skin, or to practise the inunction treatment of syphilitic affections, and for this is far superior to either the ordinary blue ointment or the mercuric oleate. In old spots of psoriasis and chronic plantar and palmar eczema it can be used alone, or combined with some form of tar or naphthol.

*Morphine Oleate* has only a feeble action upon the integument, and has no special advantage.

*Nickel Oleate*, in the form of ointment with some fatty base, has a very decided astringent action upon abraded surfaces. In the proportion of from 5 to 20 grains to the ounce of lard it acts well in epithelial ulcerations, old callous ulcers, or chronic eczemas.

*Quinine Oleate* has slight stimulant and antiseptic action, but has no special advantages.

*Silver Oleate* coagulates albumin, and, when sprinkled over sores, coats the surface and excludes the air; at the same time it stimulates granulations and cleans off the surface. Dissolved in oleic acid and mixed with lard (5 to 60 grains to the ounce), it forms a dark-brown, pliable ointment, which may be applied in cases of erysipelas to keep the inflammation from spreading. In superficial lupus it sometimes lessens cell-infiltration and reduces active inflammation. In boils, carbuncles, eczema around the genitals or on the buttocks, especially if attended by irritation or itching, marked relief follows the application, either alone or combined with opium, belladonna, or hyoscyamus.

*Strychnine Oleate* has no special value as an ointment.

*Tin Oleate.*—The ointment (10 to 60 grains to the ounce) is a grayish-brown ointment, possessing some astringent and tonic action. It is of especial service in diseases of the nails, and in irritation of skin around the nails (agnail, etc.).

*Veratrine Oleate* (U. S. P.) is official in 2-per-cent. solution in ointment. It has decided counter-irritant and benumbing effects upon the skin, making it useful in some cases of neuralgia or tender spots.

*Zinc Oleate* (U. S. P.) is a fine, pearl-colored powder, soft and soap-like to the touch, is astringent in its effects, and can be used as a dusting-powder in hyperidrosis and bromidrosis. In local sweating of the axillæ, genitalia, hands or feet, especially when attended by maceration of the epidermis, this agent is very useful. Murrell, of London, has also used it in the sweating of phthisis, combined with thymol (1 to 500). Salicylic acid (3 per cent.) or French chalk may be added to it, for the treatment of local affections, such as comedo and acute vesicular eczema. In all such acute inflammatory affections it can be used with advantage, where greasy applications cannot be borne. It has also been used in gynæcology as an application to cancerous ulceration of the cervix uteri. Here it may be combined with iodoform (zinc oleate 1, iodoform 2 parts).

### ACIDUM OXALICUM.—Oxalic Acid.

**Dose**, gr. ss.

**Pharmacology and Therapy.**—Oxalic acid is an irritant poison, and is sometimes taken by mistake for Epsom salts. Its antidote is lime, chalk, or whitewash. Taylor states that one drachm is the smallest quantity which is known to have caused death.

Oxalic acid has, at the suggestion of Dr. F. Poulet, been employed as an emmenagogue. Dr. A. W. Marsh has found it useful in amenorrhœa. He remarks that the remedy is not unpalatable, and, in medicinal doses, is unirritant to the stomach. Dr. Marsh also recommends oxalic acid in the treatment of acute cystitis from whatever cause. He is accustomed to prescribe :—

| | |
|---|---|
| ℞ Acidi oxalici, | gr. xvj. |
| Syr. aurant. cort., | f℥j. |
| Aquæ pluvial., | f℥iij. |

M. ft. sol. Sig.: Teaspoonful every four hours.

In some cases where oxalic acid was given in ½-grain doses Dr. F. W. Talley, of Philadelphia, observed that the remedy caused nausea, gastralgia, and an eruption resembling urticaria. When administered in solution the acid must be dissolved in either rain or distilled water in order to avoid the deposition of oxalate of calcium.

Poulet has found oxalic acid useful, likewise, as an expectorant in asthma, capillary bronchitis and tuberculous bronchitis. He recommends the following formula:—

| | |
|---|---|
| ℞ Acid oxalici, | ʒss. |
| Infus. camelliæ, | f℥vj. |
| Syr. aurant. cort., | f℥ij. |

M. ft. sol. Sig.: A teaspoonful every hour.

Dr. Talbot Jones, of Saint Paul, has reported* four cases in which acute articular rheumatism was apparently produced by prolonged contact with a solution containing oxalic acid. The patients, engaged in making bluing, were accustomed to keep the hands and forearms immersed while stirring the solution.

## ACIDUM PHOSPHORICUM (U. S. P.).—Phosphoric Acid.

### *Preparations.*

*Acidum Phosphoricum Dilutum* (U. S. P.).—Diluted Phosphoric Acid. *Dose*, ♏ii–xx.

The official phosphates are calcium, iron, and sodium.

The official hypophosphites are calcium, iron, potassium, and sodium.

**Pharmacology.**—Phosphoric acid in the solid form, glacial phosphoric acid, is not official in the present edition of the pharmacopœia, on account of its unreliability. The official phosphoric acid is a colorless, odorless, syrupy liquid, containing not less than 85 per cent., by weight, of orthophosphoric acid. The diluted acid contains 10 per cent., by weight, of absolute orthophosphoric acid.

**Physiological Action.**—Phosphoric acid, locally, is an irritant, and exerts some escharotic effect. When taken internally, well diluted, it aids nutrition and growth, as it is an essential element in all bony and vascular structures in the form of phosphates. It is also, like nitric acid, a stimulant to oxidation. It improves the appetite and the digestion, increases secretion, and is synergistic with the vegetable bitters. Phosphoric acid has been known to give rise to an eruption resembling that of pemphigus.

**Therapy.**—In all debilitated conditions of the system, in anæmia, in the exhaustion of prolonged lactation, in bronchial catarrh of the aged, phosphoric acid is an excellent tonic; it is also useful in struma and wasting diseases. Its action being different from phosphorus in substance, it is less efficient than that drug in the treatment of neuralgic conditions.

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* *Northwestern Lancet*, June 15, 1892.

Phosphoric acid is especially valuable as a tonic in the following formulæ:—

| | |
|---|---|
| ℞ Acidi phosphorici dil, | f℥ss. |
| Tinct. nucis vomicæ, | ♏cc. |
| Tinct. ferri chloridi, | f℥ij. |
| Syr. pruni virg., | f℥iiss. |

M. Sig.: From one-half to one teaspoonful in a wineglass of water, taken through a tube after meals.

| | |
|---|---|
| ℞ Acidi phosphorici dil., | fʒiij. |
| Strychninæ sulph., | gr. ss. |
| Glycerini, | fʒix. |
| Syr. aurantii, | f℥iiss. |

M. Sig.: One teaspoonful in wine-glass of water, taken through a tube after meals.

| | |
|---|---|
| ℞ Acidi phosphorici dil, | fʒv. |
| Sodii hypophos., | ʒij. |
| Elix. calisayæ, | f℥iiss. |

M. Sig.: One teaspoonful in water before meals.

Under the name of liquor acidi phosphorici compositus an excellent tonic is composed of the following ingredients.

| | |
|---|---|
| ℞ Calcii phosphatis, | gr. 384. |
| Magnesiæ phosphatis, | gr. 64. |
| Potassii phosphatis, | gr. 32 |
| Ferri phosphatis, | gr. 64. |
| Acidi phosphorici (S. G. 1.70)., | ♏ 808. |
| Aquæ, | q. s. ad f℥xvj. |

M. Sig.: This preparation may be given in teaspoonful doses.

Given before meals, phosphoric acid is beneficial in hyperacidity of the stomach, whether due to increased production of hydrochloric acid or the result of fermentative changes in the food. Phosphoric may reasonably be preferred to the other mineral acids in the treatment of typhoid fever when the predominant symptoms denote great nervous prostration. In diabetes mellitus phosphoric acid answers a useful purpose by assuaging thirst. It has been employed in the treatment of rachitis.

The diluted solution may be applied as a stimulant to indolent ulcers, and it has been proposed to inject it into enlarged glands (lymphadenoma).

### ACIDUM PICRICUM.—Picric Acid.

**Dose**, gr. $\frac{1}{4}$–ij.

**Pharmacology.**—Picric or carbazotic acid (trinitrophenol) is in the form of pale-yellow scales, soluble in water, and has a very bitter taste. Owing to its power of coagulating albumin, its watery solution forms a convenient test for albumin in the urine; it is also a test for peptones. It should be used as a confirmatory test in conjunction with the heat test and Heller's test with nitric acid.

**Therapy.**—The application five to ten times daily of a 6-per-cent. solution of picric acid has been found useful in erysipelas. Picric acid constitutes also a good dressing to superficial burns and has been used for several years for this purpose in the Charity Hospital of Paris. A saturated solution (about 0.5 per cent.) of picric acid is applied upon compresses. It exerts an analgesic effect upon the surface. It usually gives rise to no irritation, and the only disadvantage of the method is that the solution communicates a yellow stain to the tissues with which it comes in contact. The late Dr. Quinquaud recommended picric acid as a local remedy in epithelioma. In chronic eczema Calvelli claims good results from the application, several times a day, of a solution of 1½ parts of picric acid in 250 parts of distilled water.

The ammonium salt has been highly praised in the treatment of whooping-cough and malaria, the average dose being ½ grain four or five times daily. Dr. Marten Clark asserts that this salt has proved efficient in malarial neuralgia. Picric acid should be used, either internally or externally, with caution, since it is apt to excite urticaria and other symptoms of systemic intoxication.

Shoes lined with leather dyed yellow by picric acid have been known to excite violent dermatitis, the feet becoming swollen and being covered by innumerable vesicles which coalesced and became filled with purulent serum. Constitutional reaction was also occasioned.

### **ACIDUM SALICYLICUM** (U. S. P.).—**Salicylic Acid.**

**Dose,** gr. x–ʒj.

**Pharmacology.**—Salicylic acid is made by treating a solution of carbolic acid in caustic soda with carbonic acid at a moderate heat. It occurs as fine, white, needle-shaped crystals, soluble in 450 parts of cold or 14 parts of hot water; and in alcoholic solutions in 80 parts of chloroform, 60 parts of glycerin, and in 2 parts of olive-oil (by aid of heat). One ounce of sweet spirit of nitre will dissolve 16 grains of salicylic acid. The solution remains clear even upon the addition of water. Crystallized salicylic acid is pure and without odor; precipitated acid has a rather peculiar disagreeable taste; the sublimed acid is often pink-colored, and smells of phenol. Dialyzed salicylic acid is preferred. It is claimed that the salicylic acid made from oil of gaultheria is the best and purest form in which to prescribe it. Pure salicylic acid melts at 308.6° F. and when a small quantity of its solution in ether is poured upon a glass plate and the menstruum evaporated the deposit must retain its white color. Salicylic acid should not be prescribed in conjunction with exalgine, as a reaction takes place between the two substances.

**Physiological Action.**—Salicylic acid is an antiseptic and antiferment, and prevents souring of beer, cider or milk, or the putrefaction of urine. It arrests the action of saliva upon starchy food. It is injurious only when used constantly and in relatively large doses. It is very irritating to mucous surfaces, and is not to be administered in pill, powder, or capsule, but always in solution, and preferably with ammonium or potassium acetate, potassium citrate, or ammonium phosphate, which increases its solubility in water, or it may be given in some syrup or elixir of orange.

Taken internally, it reduces abnormally high temperature. In health this action is not observed, although some observers assert that a slight reduction is produced. Sometimes headache, giddiness, and ringing in the ears have been noticed, but usually no marked effect is seen upon either pulse or respiration. According to Vanden Corput, salicylic acid diminishes the functional activity of the testes and ovaries. Salicylic acid causes congestion of the uterus and ovaries. It may produce abortion and, therefore, should be cautiously given in pregnancy, especially when a tendency to abortion or premature confinement exists. Toxic doses cause slowing of the breathing; and convulsions, nausea, burning in the throat, vomiting, and gastric irritability have been observed to occur, followed occasionally by albuminuria, hæmaturia, or almost complete stoppage of urine. This is a deviation from the normal action, for in ordinary cases it acts as a diuretic, with slight increase of elimination of the urates and urea. Piccinini states that after the administration of sodium salicylate peptone is to be found in the urine. Salicylic acid is absorbed with rapidity, but slowly eliminated. In acute nephritis it diminishes the quantity of the urine and increases the proportion of albumin. It is stated that deleterious effects are particularly apt to occur in drunkards from the use of salicylic acid.

The treatment of intoxication by this agent is that for an irritant poison; the stomach should be washed out with warm water, decoction of coffee administered, and the patient treated symptomatically. The effects rapidly pass off as the acid is carried out from the system by the urine, principally without change, partly also as salicin and salicyluric acid. Probably some also escapes in the sweat and saliva. After excessive doses the urine becomes olive-green in color, from the presence of indican and pyrocatechin. These substances result from the action of the pancreatic juice upon salicylic acid. A solution of chloride of iron strikes a violet color with urine which contains salicylic acid. In the body, the acid combines with glycocol in the liver and elsewhere, and becomes converted into salicyluric acid. The ingestion of salicylic acid or sodium salicylate may be followed by the development of various cutaneous lesions. Erythema with œdema, intolerable itching and tingling of the skin and fever have been caused by large doses of the sodium salt. Other effects which have been observed are vesicles, pustules and patches of ecchymosis.

**Therapy.**—For external use salicylic acid may be combined with chalk as a dentifrice where there are carious teeth. A similar mixture may be used for the relief of fetid perspiration (feet or axilla), with talc or corn- or rice-flour. In gangrene, or sloughing cancer, it may be applied full strength or diluted. Dressings may be saturated with an alcoholic solution, and subsequently dried. In this way it may be used in the antiseptic method of wound treatment; it is not so powerful in this direction as carbolic acid, yet it has the great advantages of being odorless and free from danger of toxic symptoms following absorption. It is also used in solution as a substitute for carbolic acid in the details of the modern antiseptic method. (A solution can be made by adding 8 parts of borax to 100 parts of boiling water, and, when dissolved, adding 10 parts of salicylic acid, and filtering when cool. On account of its irritant action it is not a good application for diphtheria or croup.) A saturated solution of salicylic acid in collodion is a very effective application to corns and warts. Tincture of cannabis indica is often added, but it produces an unsightly stain without conferring any additional advantage. The solution of salicylic acid in collodion is likewise asserted to be an efficacious application in scabies, the skin having previously been cleansed by means of a hot alkaline bath. An ointment containing this substance is sometimes of benefit, especially in chronic eczema and in ulcerated lupus vulgaris. A similar application is efficacious in lupus erythematosus of the face and eyelids. A powder composed of 5 parts of salicylic acid, 15 parts of zinc oxide and 30 parts of powdered starch may be employed in order to relieve the itching and smarting of urticaria. From 5 to 60 grains to the ounce of lard, lanolin, or other excipient will sometimes remove freckles. On account of its germicidal virtue it may be advantageously used in the treatment of tinea circinata.

It has been found useful as a topical application in thrush and catarrhal stomatitis, in which conditions it acts as a local anodyne. It allays the burning pain of the erosions left after the vesicles have ruptured. The solution is made by dissolving 1 part of acid in sufficient alcohol and adding 250 parts of water. Salicylic-acid solutions have likewise proved of value in irrigation of the large intestine for dysentery. Acute intestinal catarrh has been treated in the same manner with very successful results. In the latter malady the internal use of the remedy may be conjoined.

Salicylic acid may also be employed in fetid bronchitis as an inhalation with a steam-atomizer, using half an ounce of borax in 17 fluidounces of boiling water, to which half an ounce of salicylic acid is to be added. The same solution can be used in catarrhal pneumonia, in phthisis, etc.

The following formulæ will be serviceable as local applications:—

℞ Acidi salicylici, . . . . . . . ʒ ij.
Bismuth. subnitrat., . . . . . . . ℥ ss
Pulv. zinci oleatis, . . . . . . . ʒ ij.
M. Sig.: Dust over the surface. Useful in excessive or fetid sweating and in seborrhœa oleosa.

℞ Acidi salicylici, . . . . . . . . ʒ ss vel ʒ j.
Ungt. hydrarg. nit., . . . . . . . ʒ iij.
Beta-naphthol, . . . . . . . . gr. x.
Ungt. zinci oxidi benz., . . . . . . . ʒ v.
M. Sig.: Rub well into the surface several times a day. For fissured eczema of the palms of the hands and soles of the feet.

An excellent application for dry eczematous patches on the skin is:—

℞ Acidi salicylici, . . . . . . . . gr. x vel ʒ j.
Bismuth. subnitrat,
Amyli, . . . . . . . . . āā ʒ ij.
Adipis (dehydrat.), . . . . . . . f℥ j.
M.

Internally, the use of salicylic acid in acute rheumatism (10- to 20-grain doses every hour until 1 or 2 drachms have been taken) for two days is generally followed by prompt relief. On account of its comparative insolubility, salicylic acid is now less used than sodium salicylate, which is given in the same doses. It is believed that the soda salt is rapidly converted into the original acid by the carbonic acid of the blood.

Salicylic acid approaches the character of a specific remedy in acute rheumatism. Its most marked effects are reduction of the articular swellings, the pain, and the fever. But it is not able to prevent the occurrence of heart trouble, or of relapse. It is a good practice, and perhaps shortens the absolute duration of the case, to reduce or abandon the salicylic acid after it has produced its most notable results, and to replace or combine it with an alkali. It does not prevent hyperpyrexia, since that condition has been known to occur while this remedy was being administered. It will sometimes give rise to delirium when administered for a considerable period in the treatment of rheumatism. The virtue of the salicylic treatment is much less decided in chronic rheumatism, though stiffness and pain are relieved in a certain proportion of cases. In subjects who are much debilitated quinine salicylate may be employed, or, if anæmia be marked, the corresponding salt of iron. In muscular rheumatism salicylic acid will sometimes afford relief, and will often fail. The pain and swelling of rheumatoid arthritis are sometimes relieved and the progress of the disease arrested by sodium salicylate. The same salt is, in some instances, serviceable in gonorrhœal rheumatism. In acute articular gout and in irregular gouty manifestations good results have likewise attended the use of salicylic acid or the sodium salicylate.

It has been found that the local application of salicylic acid is beneficial in acute articular rheumatism. The drug acts by absorption, as it may be detected in the urine within half an hour after the application has been made. Dr. Bourget, who has long relied upon the external use of salicylic acid, regards the following as the best formula:—

℞ Acidi salicylici,
Lanolin.,
Ess. terebinthin., . . . . . . . āā ʒ ij ss.
Adipis, . . . . . . . . . . ℥ ij ss.
M.

It must be noted, however, that cases of intoxication have occurred as a result of this local use of the remedy.

When the salicylate causes gastric disturbance it may be given by the rectum, which should be previously washed out by means of a purgative enema. It is well to combine laudanum with the salicylate in order to prevent irritation of the bowel. Labeeb has witnessed benefit from the local use of salicylic acid in sprains, irrespective of the presence of the rheumatic diathesis.

Salicylic acid, or its sodium salt, has been found useful in those affections so often associated with or dependent upon the rheumatic diathesis, as the various forms of neuralgia, especially migraine, trifacial neuralgia, and sciatica, chorea, tonsillitis, urticaria, and erythema nodosum. Sodium salicylate is serviceable also in erythema multiforme, especially when, as is frequently the case, the disease is dependent upon a rheumatic diathesis. The remedy suppresses the eruption and relieves the articular pains. In sciatica, Ringer prefers it to any other remedy. Rheumatic iritis may also yield to its influence.

Gay has successfully employed this remedy in Menière's disease, giving 3 grains three times a day. The attacks of vertigo, which had been very frequent, rapidly diminished in number and severity. As improvement progressed the remedy was suspended during considerable intervals.

In the experience of Dr. Strizower salicylic acid is an excellent remedy in the treatment of gall-stones. He is accustomed to give it in 10-grain doses three or four times a day in the intervals between attacks of colic, and states that it prevents the formation of concretions and hastens their expulsion.

Salicylic acid has been successfully used as an anthelmintic. Tænia solium has been removed by five-hourly doses of 8 grains each, preceded and followed by a dose of castor-oil. Round-worms and seat-worms are destroyed by the same agent, the latter by the local effect of an injection, the former by the internal use of the drug.

Salicylic acid may be given in 5-grain doses in order to purify the foul breath sometimes present in phthisis. Improvement has sometimes followed the administration of salicylic acid or its combination with sodium in diabetes. An anti-diabetic powder employed by Dr. Monin is composed as follows:—

| | |
|---|---|
| ℞ Sodii bicarbonat., | ℥ ij. |
| Sodii benzoat., | ʒ x. |
| Sodii salicylat., | ʒ v. |
| Lithii carbonat., | ʒ ss. |

M. Sig.: Teaspoonful at each meal.

The same remedy is of service in diabetic neuralgia. It is also employed for its antipyretic effect in typhoid fever, pneumonia, erysipelas, and phthisis, but it is regarded as especially serviceable in blood-poisoning and sapræmia, pyæmia, etc., and the eruptive fevers of children. Dr. De Rosa attributes prophylactic virtues to this substance in case of exposure to scarlet fever. Dr. C. A. Bryce esteems salicylic acid as of decided efficacy in the treatment of small-pox. He states that it reduces temperature, relieves pain and limits the development of pustules. In relapsing fever it is said to render the relapse shorter and of less severity. It promptly checks the yeasty vomiting dependent upon the growth of sarcina ventriculi. Sometimes serious disturbances of the circulation occur from medicinal doses in cases of fever. It is very probable that in some of these cases the results are attributable to impurities in the salicylic acid. Urticaria, erythema, and vesicular cutaneous symptoms have been noticed after its administration. Free desquamation has sometimes followed the erythema. In exceptional cases the exhibition of salicylic acid is followed by hæmorrhage, usually from the gums or nose. The soda salt is believed to be free from this objection.

Bernheim makes use of hypodermic injections of salicylic acid in order to relieve the night-sweats of phthisis. The solution which he employs contains a drachm and-a-half of the acid in 1 ounce of distilled water to which is added 3 drachms of glycerin and ½ an ounce of alcohol. He injects 30 minims of the solution on four or five successive evenings. The same writer has reported five cases of inoperable cancer of the cervix uteri in which the injection of salicylic acid into the growth was followed by disappearance of the hæmorrhages and offensive discharge, with diminution in the size of the tumor. Sodium salicylate in 10-grain doses will sometimes assuage the pain of carcinoma.

The granular effervescent form is a good one in which to administer the salicylates, or they may be given in effervescent draughts, or in combination like this :—

| | |
|---|---|
| ℞ Sodii salicylatis, | ʒ ij. |
| Tinct. lavandulæ comp., | f℥ iv. |
| Syrup. aurantii, | f℥ iiiss. |

M. Sig.: Give a tablespoonful every three (or four) hours for acute rheumatism.

The following prescriptions may likewise be recommended as beneficial combinations in acute rheumatism, gout, and neuralgia :—

| | |
|---|---|
| ℞ Acidi salicylici, | ʒ ij. |
| Spt. ætheris nitrosi, | f℥ iv. |
| Tinct. cardamom. co., | f℥ j |

M. Sig.: Two teaspoonfuls in water every two hours.

| | |
|---|---|
| ℞ Acidi salicylici, | gr cc |
| Liq. ammon. acetatis, | |
| Aquæ camphoræ, | |
| Spt. ætheris nitrosi, | ad f℥ ij. |

M. Sig.: A teaspoonful in water every two or three hours.

The appended formula is serviceable in chronic rheumatism and gout :—

| | |
|---|---|
| ℞ Acidi salicylici, | ʒ iij. |
| Elix. cascaræ sagradæ, | f℥ vj. |

M. Sig.: A tablespoonful in water two or three times a day.

On account of its influence upon the utero-ovarian circulation the drug may be tried in cases of amenorrhœa and dysmenorrhœa. Sodium salicylate has been used with excellent effect in chronic pleurisy. It promotes absorption of the effusion by a powerful diaphoretic and probably also specific action, comparable to that which it exerts in rheumatism.

Since the use of salicylic acid has sometimes been followed by anæmia, Professor Peabody, of New York, is accustomed in many cases to combine it with iron, as follows:

| | |
|---|---|
| ℞ Acid. salicylic, | gr. xx. |
| Ferri pyrophosph., | gr. v. |
| Sodii phosphat., | gr. 1. |
| Aquæ, | f℥ ss. |

M. Sig.: To be taken at a dose.

**Tolysal.**—The name tolysal has been given to a substance, which in chemical composition is the salicylate of tolypyrin, the latter being a lately introduced synthetical compound analogous to antipyrin. Tolysal occurs in the form of small, almost colorless crystals, of somewhat bitter taste, slightly soluble in water, soluble with difficulty in ether, easily soluble in alcohol and acetic ether. As far as our present experience extends, tolysal has no cumulative effect nor does it establish a habit. It has a favorable influence upon sleep and gives rise to no unpleasant after-effects.

Tolysal is of marked efficacy in acute articular rheumatism as well as in chronic forms of the disease and in muscular rheumatism. It has produced improvement in rebellious cases which had remained uninfluenced by salicylic acid as ordinarily administered. Tolysal has also an analgesic effect and proved useful in the treatment of rheumatic neuralgia. In articular rheumatism it has been administered in daily doses of 45 to 90 grains. As an anodyne the dose is 15 to 45 grains and in rheumatic neuralgia from 15 to 30 grains during the same period.

Tolysal exerts a decided antipyretic action in both continued and remittent fevers. With the reduction of temperature the frequency of the pulse and respiration decreases. It has also been found useful in influenza.

Dr. Bothe has used tolysal with advantage in neurasthenia. It relieves the daily headache and nightly insomnia from which patients often suffer. He reports good results also from its employment in the insomnia of the insane without excitement.

**Antispasmine.**—A substance upon which this name has been bestowed consists of one molecule of narceine sodium and three molecules of sodium salicylate. Antispasmine is a white powder, slightly hygroscopic, readily soluble in water, of an alkaline reaction and contains about 50 per cent. of pure narceine. This compound was found serviceable by the late Professor Demme in relieving various spasmodic affections and was recommended as well adapted for use among children. It was employed with advantage in pertussis and other forms of nervous cough. The dose is from $\frac{1}{10}$ grain to $1\frac{1}{2}$ grain.

**Salaktol.**—This name has been unwisely chosen, since it bears too close a resemblance to that previously given to a different compound, salacetol. Salaktol is a combination of sodium salicylate, sodium lactate and hydrogen dioxide. It is reported to be an excellent application in diphtheria, being painted upon the throat every two or three hours, and given internally in tablespoonful doses at the same intervals. Salaktol is also utilized as a gargle and by inhalation.

**Borsalyl.**—A compound obtained by the action of 25 parts of boric acid on 32 parts of sodium salicylate in the presence of a small quantity of distilled water is called borsalyl, and is proposed as a useful antiseptic for external application.

**Salicylamid.**—This is a yellow crystalline substance, without odor or taste, and soluble in hot water. It is said to be efficient in smaller doses and to possess more analgesic power than salicylic acid.

Commercial salicylic acid may be contaminated by the presence of para- and ortho-cresotic acids, which have remained in the process of manufacture. Both these substances are toxic. Professor Charteris, of Glasgow, found paralysis and death to be caused in rabbits by doses of 3 grains of the former per pound of the body-weight. Ortho-cresotic acid produced the same symptoms and was fatal to the rabbit in the dose of 1 grain per pound weight. The cresotate of sodium has been employed therapeutically as an antipyretic in doses of $1\frac{1}{2}$ to 2 drachms. Demme used it in acute rheumatism, catarrhal pneumonia and typhoid fever among children, and in the gastro-intestinal catarrh of nursing women. In rheumatism it is claimed to be better borne than salicylic acid. For young children the maximum daily dose is given as 7½ to 15 grains.

A derivative of salicylic acid called salicyl-sulphonic, or sulphosalicylic acid, has been brought forward as a test for albumen.

### ACIDUM SULPHORICINICUM.—Sulphoricinic Acid.

**Pharmacology.**—This derivative of castor-oil is but slightly irritant to the skin, though rapidly fatal to animals when injected into the veins, pleura, or peritoneum. The sulphoricinate of sodium is made by exactly neutralizing sulphoricinic acid with soda.

**Physiological Action.**—The salt adheres well to the skin, is antiseptic and deodorizing. Berlioz found that a 10-per-cent. solution entirely destroyed the odor of five or six times its weight of very fetid pus.

**Therapy.**—The sodium salt has been used as a topical remedy in ozæna, diphtheria, and laryngeal tuberculosis. Several antiseptic compounds have been prepared with the sulphoricinate of sodium. Sulphoricinated naphthol forms an emulsion which has been used in ozæna. Sulphoricinated creasote is used pure or made into an emulsion with water in laryngeal tuberculosis. Sulphoricinated salol has been employed either in its own form, or diluted, as an application to ulcers. Sulphoricinated phenol is made by dissolving with a little heat 40 grammes of pure carbolic acid with 100 grammes of sulphoricinate of sodium. A solution of one-fourth of this strength is used in some of the hospitals of Paris in diphtheria. The mixture adheres well to the surface and does not irritate or cause pain. It is applied upon pledgets of cotton and is not washed off by gargles or irrigations. A combination of 10 parts of salol, 2 parts of creasote or terpene hydrate, and 80 parts of sulphoricinate of sodium is also serviceable in diphtheria.

### ACIDUM SULPHURICUM (U. S. P.).—Sulphuric Acid.

*Preparations.*

*Acidum Sulphuricum Dilutum* (U. S. P.).—Diluted sulphuric acid. *Dose,* ♏v–xv.

*Acidum Sulphuricum Aromaticum* (U. S. P.).—Sulphuric acid, with tinct. ginger, oil of cinnamon, and alcohol. Aromatic sulphuric acid. Elixir of vitriol. *Dose,* ♏x–xx.

**Pharmacology.**—The official acid is chemically pure, containing not less than 92.5 per cent. by weight of absolute sulphuric acid. It must be colorless, and should be kept in glass-stoppered bottles; it is without odor, and is of an oily consistence. The commercial acid (oil of vitriol) contains various impurities,—arsenic, lead, nitric acid, etc.

**Physiological Action and Toxicology.**—Sulphuric acid in full strength chars animal substances and has a strong affinity for water. Applied to the skin, it acts as a caustic, re-dissolving the coagulum formed and penetrating deeply, turning the surface black. When taken internally, the lips and other parts of the mouth are blackened, and symptoms of corrosive poison are produced; there is intense pain, with efforts at vomiting. Collapse and death may rapidly ensue from the intense congestion of the œsophagus and stomach, or it may occur secondarily from the resulting strictures of the œsophagus.

Renal lesions have been found by Drs. Eugene Fränkel and F.

Reiche in three cases of poisoning from sulphuric acid, one of which caused death in five hours, while the other two cases were fatal in from two to four months. The appearance of the organs was much the same in the three cases. In each coagulation-necrosis was present and was more extensive in the first than in the succeeding cases, in which the lesion was limited to small patches.

The stomach-pump should be used with extreme care on account of the danger of tearing the softened mucous membrane or rupturing the stomach Alkalies should be given with milk or soap-water, and morphine given hypodermically to relieve pain, combined with atropine as a cardiac stimulant. Oil, white of eggs, and magnesia are also appropriate. Demulcents and appropriate treatment for the succeeding inflammation will be needed. Sulphuric acid is sometimes thrown upon a person, especially in the face. In such a case water is freely used to wash off the excess of acid, and an alkaline wash applied; to relieve pain opium internally will be needed. The subsequent treatment is that of an ordinary burn.

Sulphuric acid is eliminated to a small extent by the kidneys and probably also by the lower bowel and skin.

**Therapy.**—On account of the pain following its application, sulphuric acid is not much used as a caustic, although it is an efficient destroyer of tissue. Velpeau used it in cancer, and Ricord for chancres, the acid being mixed with some absorbing substance like sawdust or charcoal. In caries and necrosis, and suppurating cavities or sinuses, it may either be applied upon a glass rod or on lint, diluted with 4 to 6 parts of water.

Internally, dilute sulphuric acid acts as an astringent and antiseptic. The elixir of vitriol is the preferred form for the night-sweats of phthisis, and in some cases of diarrhœa. Sulphuric acid, with water, sweetened so as to make a pleasant drink, is a valuable prophylactic against lead poisoning when used by operatives in lead works, and also has been found to be a preventive of attacks of Asiatic cholera, when taken regularly during the prevalence of an epidemic:—

| | |
|---|---|
| ℞ Acid. sulphurici diluti, | f ʒ iiss. |
| Tr. opii deodorati, | f ʒ j. |
| Elixir, | f ℥ j. |
| Aquæ, | q. s. ad f ℥ iv. |

M. Sig.: Take a tablespoonful for dysentery, every hour or two. Watch with care the action of the opium.

This acid is very commonly given in typhoid fever. It may be preferred to hydrochloric acid when the diarrhœa is excessive. Lead colic is relieved by the use of sulphuric acid, and the constipation of lead poisoning is effectually treated by a combination of diluted sulphuric acid, quinine sulphate, and magnesia sulphate. On account of its astringent properties it is beneficial in hæmorrhage from the uterus, stomach, or intestinal canal, and in purpura. The following prescriptions have been found beneficial:—

| | |
|---|---|
| ℞ Acid. sulph. aromat., | f ℥ ij. |
| Ext. hamamelidis fl., | f ℥ ij. |
| Ext. ergotæ fl., | f ℥ ij. |

M. Sig.: Two teaspoonfuls in water every two or three hours. Use especially in hæmorrhage from lungs, stomach, or womb.

| | |
|---|---|
| ℞ Acidi sulph. aromat., | f℥ss |
| Magnesii sulph., | ℥ij. |
| Spts. chloroformi, | fʒiij. |
| Inf. rosæ gallicæ, | q. s. ad f℥viij. |

M. Sig.: A tablespoonful every three hours. Useful in hæmorrhage from rectum, and constipation.

| | |
|---|---|
| ℞ Acidi sulph. dil., | f℥ss. |
| Quininæ sulph., | gr. xij. |
| Tinct. opii, | fʒij. |
| Syrupi et aquæ, | q. s. ad f℥iij. |

M. Sig.: A teaspoonful in water every four hours in enteric fever with tendency to diarrhœa and sweating. Also useful in sweating of phthisis.

*Acidi Sulphurici Liquor Halleri* (Haller's acid drops)—not official—is a mixture of equal parts, by weight, of acid and alcohol, gradually added with constant stirring, taking care that the temperature of the mixture does not get so high as to vaporize the alcohol. It contains ether, alcohol, sulphuric acid and sulpho-ethylic acid, and is used for the same purpose as the aromatic acid, in about half the dose, on account of the larger amount of acid.

*Acidum Sulphovinicum*, or ethyl-sulphuric acid, is prepared by adding sulphuric acid to alcohol. It is freely soluble in alcohol, and mixes with water (1 or 2 parts) without losing its oily character. It is a yellowish liquid, with slightly astringent taste, and is neutral in reaction. The ethyl sulphates are crystallizable and soluble in water. The ethyl-sulphate (or sulphovinate) of sodium has been used as a saline cathartic. Ethyl-sulphuric acid is an example of an acid ether, and is a solvent for camphor (25 per cent.), iodoform (3 per cent.), sulphur, naphthalin, chrysarobin, etc., and can be used as a vehicle for these remedies in the treatment of skin diseases.

### ACIDUM SULPHUROSUM (U. S. P.).—Sulphurous Acid.

**Dose,** ♏ v–fʒj, well diluted.

**Preparations.**—In combination with a base, sulphurous acid makes sulphites. Of its combinations, the following are official: Sodium sulphite; also, sodium bisulphite and sodium hyposulphite.

**Pharmacology.**—Sulphurous-acid gas absorbed by water forms the official acid. It has the odor of burning sulphur, and a sour, sulphurous, somewhat astringent taste.

**Physiological Action.**—This acid and its salts are very destructive to low forms of animal and vegetable life, owing to their affinity for oxygen. It is not well borne by the stomach, and should be given freely diluted with water, as its taste and odor are very unpleasant. Locally, it does not excite much irritation in medicinal doses, but inhalation of air containing from 1 to 3 parts of sulphurous acid per 1000 produces in animals intense inflammation of the respiratory passages and lungs. Injection of a 5-per-cent. solution into the stomach was found by Dr. L. Pfeiffer to excite severe gastritis. Animals not killed by the acid recover very rapidly from the immediate effects, though they may subsequently perish from inflammation. Pfeiffer has demonstrated that 96.5 per cent. of sodium sulphite is eliminated in the urine as sulphate, the remainder only as sulphite. Nearly all of a large quantity of sulphite administered was eliminated in five hours.

**Therapy.**—As a local antiseptic or bactericide, sulphurous acid is highly prized in those forms of skin disease caused by parasitic invasion, such as tinea tonsurans and tinea versicolor. It may be effectively used in tinea favosa by the simple device of Dr. Schuster. A net of strings is stretched across the lower third of a card-board box, which fits to the head and can be closed by a lid of the same material. A saucer containing burning sulphur is laid upon the net of strings and the box covered. The patient must sit still for half an hour. An abundance of sulphurous-acid gas is generated, the sulphur ceasing to burn, of course, as soon as all the oxygen is exhausted. In various forms of sore throat it is useful, but particularly in diphtheria, where it can be used topically and also taken internally.

It is beneficially applied to unhealthy or sloughing wounds or ulcers. A drachm or two of the official acid to the ounce of water, or water and glycerin, is of service in chilblains and chapped hands. Sulphurous acid, as Ringer points out, may be used in such a manner as to cure scabies with the utmost rapidity. This method consists in exposing the patient, his head excepted, to the influence of sulphurous-acid gas, generated by burning 12 drachms of sulphur in a suitable closed apparatus. The clothes should be, at the same time, put in boiling water. Dr. Dewar recommends equal parts of sulphurous acid and of water as an efficient dressing in erysipelas.

In fermentation of food in the stomach, flatulent dyspepsia with sour stomach, pyrosis, dilated stomach, etc., sulphurous acid has been recommended. In typhoid fever it has also been used, and, it is asserted, with success, and may be tried in measles, scarlatina, and smallpox. In some bronchial affections, catarrh, whooping-cough, dilated bronchial tubes, it may be inhaled with steam-atomizer. It is also of great service in many skin affections, such as urticaria and purpura, after other methods have failed.

The author would recommend the following formulæ for the diseases just referred to:—

℞ Acidi sulphurosi,
Syrup. zingiberis, . . . . . . . . . . āā f℥ij.
M. Sig.: From one to two teaspoonfuls in water three times a day.

℞ Acidi sulphurosi,
Ext. ergotæ fl.,
Syrup. aurantii, . . . . . . . . . . āā f℥j.
M. Sig.: Two teaspoonfuls in water three or four times a day.

The sulphites and hyposulphites are employed to fulfill the same indications. The administration of the sulphites in pyæmia was advocated by Polli, but later clinical observers have not been able to obtain the good results that he promised. The sulphides will be considered under the head of Sulphur.

**ACIDUM TANNICUM** (U. S. P.).—**Tannic Acid** (**Tannin**).
**Dose,** gr. i–xx.

*Preparations.*

*Unguentum Acidi Tannici* (U. S. P.) contains 20 per cent. tannic acid.
*Trochisci Acidi Tannici* (U. S. P.), each 1 grain.
*Collodium Stypticum* (U. S. P.).—Styptic collodion consists of 20 parts tannic acid, 5 of alcohol, 25 of ether, 50 of collodion. For external use as an astringent.

**Pharmacology.**—Tannic acid is a common constituent of vegetable organisms, especially those noted for stringency, as oak-bark. Galls contain about 50 per cent. of tannic acid, which can be obtained by exposing powdered galls to dampness, and afterward dissolving out the tannic acid with the aid of ether. It occurs in light-yellowish scales, soluble in 16 parts of cold water, slightly soluble in alcohol. It is likewise soluble in glycerin. It coagulates albumin and gelatin, and strikes a black color with preparations containing iron. Solutions containing tannic acid (infusion of black tea or coffee) are antidotes for poisoning by some metallic salts, and especially antimony or tartar emetic, and the alkaloids.

**Physiological Action.**—Tannic acid, when locally applied, has an astringent action upon the tissues, owing to its affinity for albumin. Internally, it acts as a weak acid upon the digestive tract, but when its chemical affinities are satisfied by combination with a base or neutralizing it with albumin, it is no longer capable of precipitating albumin, and therefore no longer exercises an astringent action upon the parts with which it comes in contact. Hence, according to Stockman, it can exert little, if any, action upon the vascular system, and, as it is not excreted by the bronchial mucous membrane, very little or none upon the flow of the bronchial secretions. With regard to its action upon the kidneys, as it is excreted principally by this channel, it is conceivable that it may have some influence in diminishing albuminuria, although even this he regards as doubtful. Lewin recommends the administration of tannic acid in the form of an albuminate, which is free from irritation and is more readily absorbed (tannic acid, 2 parts; water, 90; mix well, and add white of egg, 10 parts). The external or internal use of tannic acid may occasion erythema or urticaria.

**Therapy.**—As a local astringent tannic acid heads the list. A combination of iodoform and tannic acid (2 to 1), finely powdered, is a good dusting-powder for moist eruptions, some forms of eczema, and for insufflation into the nose to reduce secretion in catarrh. After the severity of the inflammation has somewhat subsided, the glycerite of tannin is a good application in acute eczema. It may be applied twice daily, and allays the stinging pain and itching. A solution of tannic acid and camphor has been used with good results as a topical application in erysipelas and lymphangitis. A solution of tannic acid in glycerin (1 to 4) is a good topical application to tonsillitis or pharyngitis. It may also be used as a spray, properly diluted, in hæmoptysis. For disorders of the lower bowel, ulcers, fissures, hæmorrhoids, prolapsus, and to expel thread-worms, a solution may be injected, or suppositories used, each containing 3 to 5 grains, with cacao-butter or starch.

Liebersohn has obtained good results in severe acute dysentery from the use of hot enemata of tannic and boric acids. The injections were given every three hours and consisted of a 4-per-cent. solution of boric acid, in which 10 grains of tannin were dissolved. A few drops of laudanum were added to each enema. The effect was to arrest hæmorrhage, diminish pain and tenesmus and materially abridge the course of the disease. A plan of treatment introduced by Cantani has been used with advantage in the early stage of cholera. Large enemata of tannic acid are thrown into the bowel beyond the ileo-cæcal valve. From 1½ to 5 drachms of tannic acid dissolved in 4 pints of water with the addition of 30 drops of laudanum and 1½ ounces of powdered gum arabic are injected at suitable intervals.

A solution of tannic acid is useful in cases of leucorrhœa, and the glycerite, or iodoform-tannin, is an excellent application for catarrhal inflammation of the cervix uteri. Even in carcinoma uteri, the glycerite of tannic acid is efficient in moderating discharge and allaying odor. Its virtue may be assisted by combining it with the glycerite of carbolic acid.

The odor of ozæna and other affections attended by fetor may, according to Dr. B. W. Richardson, be overcome by the application of cotton-wool moistened in a saturated watery solution of tannin and dried.

In gonorrhœa, after the acute stage has passed off, tannic acid is a useful medicament. In men it may be administered, dissolved in water, as a urethral injection. Dr. Hanika, of Munich, has treated gonorrhœa by filling the uretha with a powder consisting of equal parts of tannin, iodoform and thallin sulphate. The powder is introduced through a metal tube once or twice daily immediately after the patient has emptied his bladder. In women, a watery solution may be used as a vaginal injection, or the vagina may be packed with tannin. Solutions of tannic acid may also be employed for the purpose of hardening tender nipples and tender feet. A concentrated solution of tannin may answer a useful purpose as a palliative remedy in ingrown nail. A lotion of tannic acid is frequently of service in herpes. It is useful in phagedenic ulcers and alopecia circumscripta. Made into a pomade, it has been found of benefit in dandruff. Ringer recommends the glycerite of tannic acid in otorrhœa, not, however, during the acute stage, but after this has been relieved and but a moderate discharge is left. The remedy is more beneficial when the membrana tympani is intact. The canal is filled with the solution, which is retained by cotton-wool.

With alkaloids, tannic acid generally forms insoluble compounds; it should not, therefore, be prescribed with preparations containing salts of quinine, strychnine, etc.

Notwithstanding the chemical arguments urged by Dr. Stockman, tannic acid has long been successfully administered as an astringent remedy. As, however, it enters the blood under the form of gallic acid, its remote effects are, in reality, due to the latter acid. Tannic acid is preferably employed as a local application, gallic acid as a systemic remedy. The therapeutical uses of gallic acid have been already described, and need not be here repeated.

Tannic acid has been used in tuberculosis under the idea that it is able to destroy the bacillus of the disease. M. Arthaud has detailed the results obtained in 2000 cases from this method of treatment. He claims that the effect of tannin is superior to that of creasote.

**Tannigen.**—This is a derivative of tannic acid in which two acetyl and three hydroxyl groups are present. Tannigen was prepared by Meyer in order that it might pass through the stomach unchanged and exert the influence of tannic acid upon the intestine. Tannigen is a yellowish-gray powder soluble in water and alkaline solutions. The substance is devoid of taste, does not disturb the appetite or digestion and may be given for a considerable period without producing tolerance or habit. It has generally been given internally in doses of 3 to 8 grains thrice daily, but from 40 to 60 grains can be taken without bad results. Tannigen proved useful in diarrhœa, more particularly in chronic cases. Its effect was less decided in acute diarrhœa or that of tubercular origin. Tannigen has been employed also in chronic inflammation of the nose and throat.

### ACIDUM TARTARICUM (U. S. P.).—Tartaric Acid.

**Dose,** gr. v–xx.

**Preparations.**—The official tartrates are antimony and potassium tartrate (tartar emetic), iron and ammonium tartrate, iron and potassium tartrate, potassium tartrate, potassium and sodium tartrate (Rochelle salt), and potassium bitartrate (cream of tartar). Seidlitz powder, or **pulvis effervescens compositus** (U. S. P.), is dispensed in two small papers, a blue one containing 2 drachms of potassium and sodium tartrate, with 40 grains of sodium bicarbonate, and a white one containing 35 grains of tartaric acid. When administered these are separately dissolved, each in about 2 ounces of water, and the two solutions mixed and drunk while effervescing. A slice of lemon improves the flavor of the dose.

**Pharmacology and Physiological Action.**—Tartaric acid is obtained by the decomposition of cream of tartar (potassium bitartrate) found in old wine-casks. It is laxative and slightly diuretic. It reduces the alkalinity of the blood and makes the urine acid. In larger doses it is an irritant; indeed, in its effects it resembles oxalic acid, and the morbid appearances are also very much the same. In excessive amounts tartaric acid retards and weakens the movements of the heart. Its saturated solutions are irritant even to the skin. In a few instances death has resulted from the ingestion of this substance. The symptoms are best relieved by demulcents, the alkalies, magnesia, chalk, soap, milk, etc.

**Therapy.**—Certain of the tartrates are used as laxatives, magnesium tartrate affording a good substitute for the citrate. Rochelle salt, in ½-ounce doses, before breakfast, is a good remedy for habitual constipation. Potassium bitartrate (in doses of gr. x–xx) exerts a decided diuretic action, and in combination with washed sulphur (1 to 2) it forms an excellent laxative remedy for hæmorrhoids.

The combination of diuretic and cathartic virtues renders potassium bitartrate very useful in the treatment of chronic Bright's disease. It relieves œdema and delays the manifestation of uræmia. For a similar reason it is useful in ascites. Potassium tartrate or Rochelle salt proves of utility in hepatic indigestion accompanied by an excess of uric acid in the urine.

### ACIDUM TRICHLORACETICUM.—Trichloracetic Acid.

**Pharmacology and Therapy.**—This acid a crystalline and deliquescent substance, readily soluble in water, is an efficacious caustic and astringent. It has been successfully employed in the removal of enlarged tonsils, hypertrophied follicles of the pharynx, and polypoid excrescences. Its action can be more strictly limited than that of some other caustics, but it is too slow for use when large masses of tissue are to be destroyed. It can be applied to the pharynx without any previous anæsthetization. The nares should first be touched with a 10-per-cent., and the larynx with a 20-per-cent., solution of cocaine. It is notable for the dryness of the eschar which it produces. Trichloracetic acid is a serviceable application to warts, vascular nævi, pigment patches, and indolent ulcers.

As an astringent, the following combination is recommended:—

℞ Iodi, . . . . . . . . . . . . . ʒss.
Potassii iodid., . . . . . . . . . . . . ℥v.
Acidi trichloracetici, . . . . . . . . . ʒss–j.
Glycerini, . . . . . . . . . . . . , fʒij.
M. Sig.: Apply to the affected surface on a pledget of cotton.

Dr. Adolph Bronner employs trichloracetic acid in the treatment of ozæna. He makes use of a 10- to 15-per-cent. aqueous solution and applies it to the mucous membrane covering the septum and turbinated bones. The operation is repeated two or three times a week for several weeks. A piece of cotton on a silver or aluminum sound is dipped in the solution and rubbed upon the affected parts. Cozzolino recommends the use of trichloracetic acid in epistaxis, touching the bleeding point with a piece of cotton saturated in a solution of 15 grains of trichloracetic acid to 1 ounce of water. This substance is also recommended as a good test for albumin. A few drops of a saturated solution or a crystal of the acid are added to the suspected fluid, and a turbid line immediately forms if albumin be present.

## **ACONITUM** (U. S. P.).—**Aconite.** (Monkshood.)

### *Preparations.*

*Extractum Aconiti* (U. S. P.).—Extract of Aconite. *Dose*, gr. $\frac{1}{4}$–$\frac{1}{2}$.
*Extractum Aconiti Fluidum* (U. S. P.).—Fluid Extract of Aconite. *Dose*, ♏$\frac{1}{10}$–j.
*Tinctura Aconiti* (U. S. P.).—Tincture of Aconite. *Dose*, ♏i–v.

**Pharmacology.**—The tuberous root of Aconitum napellus (Ranunculaceæ), a perennial plant indigenous to Europe, but sometimes cultivated here in gardens for its ornamental spike of blue flowers. All parts of the plant are poisonous, but the active principle, **Aconitine** (not official), exists in greater proportion in the root. (Napelline is probably only a weaker aconitine.) Aconitine crystallizes in rhombic or hexagonal plates, is soluble in alcohol, ether and chloroform.

Dunstan and Carr have found that different samples of aconite differ extremely as regards toxic properties. What has been termed "amorphous aconitine" contains but a very small proportion of true, or crystalline, aconitine. The same writers have ascertained that when aconitine is heated at its melting point there is obtained a new alkaloid, which they propose to call pyraconitine. This substance readily dissolves in acids, forming salts which can be crystallized. The solutions of these salts have a bitter taste and are not toxic in small doses. When heated with diluted acids, or with water in a closed tube, pyraconitine and its salts are converted into benzoic acid and an alkaloid, which has been named pyraconine. Pyraconine is soluble in water and ether. It combines with acids to form crystalline salts, which are very soluble in water.

All the species of aconitum are more or less virulently active, but A. napellus is the only official one. The root of aconite in winter-time has been dug up in the garden and eaten in mistake for horse-radish, with fatal consequences. It is only necessary to be aware of this liability in order to effectually guard against the error. The aconite-root is premorse, and is not tapering throughout its length, as the root of armoracia is; it is also of a brown color, and when scraped does not give out the irritating vapor that is so characteristic of the latter. Poisoning in this way apparently could only occur as the result of grossest carelessness or of criminal intent.

**Physiological Action.**—The effects of aconite are those of its active principle, aconitine. It should be mentioned here, in explanation of the difference in effect from different specimens of aconite, that the alkaloidal strength and the physiological activity of the plant are much affected by circumstances of its growth, the wild varieties being more poisonous than the cultivated. In this way the well-known differences between the activity of different kinds of aconitine are comprehensible. Murrell has called attention to the fact that the English drug is seventeen times stronger than the German, while the French is variable, but generally between these; the crystalline variety (Duquesnel's or Merck's aconitine) is therefore to be preferred when prescribing, on account of its uniform strength. Aconite reduces cardiac action and blood-pressure, diminishes excitability of cerebral centres, the sensory tract of the cord and the peripheral terminations of sensory nerves. It also promotes the action of the skin and kidneys. The external application of preparations containing aconite has sometimes been attended by redness and the development of vesicles, pustules and blebs. The internal use of aconite will occasionally produce decided diaphoresis together with vesiculation and more or less itching.

**Poisoning.**—Applied to the skin or mucous surface, aconite first is slightly irritant, but this is soon followed by numbness, which may be accompanied by tingling sensations. If a bottle containing aconitine be held to the nose, painful irritation of nose and eyes results. In relatively large doses death occurs very promptly, and, if given hypodermically, the fatal result may follow in less than a minute, according to Wood. It is destructive to all forms of animal and vegetable life; sometimes very small doses produce extremely serious symptoms. A case of decidedly marked impression from a quantity equal to 3 minims of the tincture has been reported by Woodbury,* in which vomiting, loss of power of extremities with paræsthesia and numbness, loss of sight, mild delirium, weak pulse, and threatened stupor and collapse occurred, life being saved apparently only by very prompt and vigorous treatment. The first symptom observed in a case of poisoning is burning or tingling in the mouth and throat, soon extending to the extremities, and sometimes over the whole body. The surface of the extremities is cool or clammy and numb, but at the same time the patients complain that they feel as if the limbs were flayed. Sight may be lost and hearing dulled, but ordinarily the intellect remains clear until the last. Convulsions occur occasionally. The pulse becomes weak and variable; slight exertion may bring on a fatal syncope. The muscular strength is early affected, so that the patient is unable to stand. Owing to the lowering of the blood-pressure and the dilatation of the arterioles caused by the aconite, the heat of the body is at first brought, with the increased blood-flow, to the surface, and there the blood loses its heat by radiation and the temperature of the interior of the body is quickly lowered. The depression is accompanied by increase of perspiration, which still further reduces temperature. This occurs more obviously when there is pyrexia present than when the temperature is normal to begin with. Death results from failure of respiration generally, but it may occur suddenly from syncope, as already stated. Aconite applied locally first paralyzes the sensory nerves, beginning with the end-organs and ascending the trunk to the centre. The motor nerves are next affected. The reflex function of the cord is impaired. Uncertainty still exists, however, concerning the mode and order in which aconite affects the different portions of the nervous system. Ringer concludes, upon the basis of his and Dr. Murrell's experiments, that aconitine paralyzes all nitrogenous tissues, abolishing the functions, first, of the sensori-perceptive centre, acting next upon the nerves, and, finally, upon the muscles. Similarly, first the ganglia of the heart are attacked, next its nerves, and lastly its muscular structure. After a fatal dose has been taken the symptoms usually make their appearance very rapidly and death may result in half an hour. The average time required to produce death is rather more than three hours, the longest case on record being five and a half hours.

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* Proceedings College of Physicians of Philadelphia. Third series, vol. x., p. 450.

**Antidotes.**—The antidotes to aconite are tannic acid, astringent infusions, alcohol, and ammonia. Digitalis appears to be the physiological antagonist to counteract the depressant effect upon the heart, or tincture of strophanthus may be substituted. The hypodermic injection of atropine also acts in the same manner. Inhalations of amyl nitrite, administered freely, appeared to save life in Dr. Elliott's case. The patient should be kept in a recumbent position. The stomach-pump, artificial respirations, ether or alcohol and tincture of digitalis hypodermically, and a hot pack may all come in requisition; even faradization over the epigastrium and cardiac region might be useful.

**Therapy.**—Locally, the benumbing effects of aconite have been utilized in the treatment of neuralgia, the best combination, probably, being the Baltimore liniment, or the *Linimentum Aconiti et Chloroformi* (N. F.):—

℞ Tr. aconiti,
Chloroformi, . . . . . . . . . . . āā fʒij.
Liniment. saponis, . . . . . . . . q. s. ad f℥iij.

M. Sig.: Poison. For external use. To be applied along the course of the affected nerve.

The oleate of aconitine has also been used (2 per cent.) with asserted good results for this purpose. An ointment of aconitine is officinal in the British Pharmacopœia. This preparation contains 8 grains to the ounce of lard, the aconitine being dissolved in ½ fluidrachm of rectified spirit before being rubbed up with the fat. Aconitine ointment will often assuage the pain of chronic rheumatism, gout, and myalgia. It serves the same purpose, also, in herpes zoster, but care must be taken, in this affection, not to apply it to the abrasions produced by rupture of the vesicles. The same ointment also affords relief in neuralgia of the skin, paræsthesia, or pruritus, papular eczema, and prurigo. It must never be placed upon a raw surface.

Its control over the circulation places aconite in the first rank in the treatment of the fever process, but in order to get the best results it should be given in fractional doses (every ten, fifteen, or twenty minutes give a teaspoonful of water from a tumbler in which a few minims of the tincture have been dropped). This is invaluable in the treatment of the ephemeral fevers of childhood, and hyperpyrexia attendant upon the exanthemata. In adults, the results are also very positive; so that aconite has almost entirely taken the place of the lancet in the antiphlogistic treatment. Aconite, however, should be avoided in typhoid fever or other diseases of asthenic character.

In the early stage of inflammatory processes—pneumonia, pleurisy, pericarditis, peritonitis, erysipelas, rheumatism, meningitis—and in children's diseases, it modifies materially the severity of the symptoms, reduces temperature, and moistens the skin.

In the treatment of rheumatic iritis, Dr. Jonathan Hutchinson recommends the tincture of aconite in 10-minim doses three times a day, given in combination with the iodide of potassium and alkalies. He looks upon aconite as of service in mitigating the pain of carcinoma. Aconite serves a useful purpose in acute congestion of the brain. In spasmodic croup, aconite relieves the dyspnœa within a few hours. Aconite has been recommended as of service in relieving the vomiting of pregnancy. It is asserted that aconite is an antidote to the sting of the scorpion.

Asthma, especially in children, and preceded by coryza, is generally benefited by the use of this remedy. Ringer states that a drop of the tincture every hour is useful in acute gonorrhœa. In coryza and quinsy, or crescent tonsillitis, it is highly prized for its influence in shortening the course of the disease; and it has also been given to abort or prevent urethral fever after the use of instruments. It affords prompt relief in congestive dysmenorrhœa; and in amenorrhœa, produced by exposure to cold, it is often efficacious in re-establishing the flow. In facial neuralgia, the extract may be given internally, in combination with quinine and a carminative, viz. :—

| | |
|---|---|
| ℞ Extracti aconiti, | gr. iv. |
| Quininæ bisulphat., | ʒj. |
| Piperin., | gr. v. |

Div. in pil. no. xx.

Sig.: Give one every two hours until relieved, and then one every four hours as long as needed.

In migraine, or sick-headache, it may be combined with cannabis indica :—

℞ Tr. aconiti, . . . . . . . . . . . . ♏ij.
Tr. cannabis indicæ, . . . . . . . . . ♏xv.
Tr. cardamom. co., . . . . . . . q. s. ad f℥j.
M. For one dose, to be repeated every hour, or two hours, until patient is relieved.

Aconitine should never be given, even in the smallest dose, where there is a weak or fatty heart. It is used by Gubler in the treatment of facial neuralgia, and Seguin also advocates the crystallized aconitine in trigeminal neuralgia, in doses of $\frac{1}{300}$ or $\frac{1}{250}$ grain, to begin with, repeated cautiously, and gradually increased until numbness is felt through all the body, with chilliness and, in some instances, even nausea and vomiting. Napelline has also been used in facial neuralgia in doses of $\frac{1}{2}$ grain, repeated every two hours until the pain has disappeared.

Tison has employed the crystallized aconitine nitrate in the treatment of facial erysipelas, and reports that it almost invariably diminishes the duration of the disease and prevents the occurrence of complications. It is a very energetic salt, but it can be readily administered and regulated as regards dose by dissolving it in a mixture of distilled water, glycerin and alcohol, having exactly the density of distilled water, so that 50 drops contain $\frac{1}{64}$ grain. It may, therefore, be used in the dose of $\frac{1}{3200}$ grain or 1 drop of the solution. He usually adds $\frac{1}{64}$ grain of aconitine nitrate to a mixture and gives it, in divided doses, in the course of twenty-four hours.

Aconitine cannot be regarded otherwise than as a dangerous remedy. It has been found that the dose varies greatly in different subjects. In nervous palpitation and overaction of a heart somewhat hypertrophied, and in the tobacco-heart, aconite cautiously used gives much relief.

## ADEPS (U. S. P.).—Lard.

### *Preparations.*

*Adeps Benzoinatus* (U. S. P.).—Benzoinated Lard (benzoin, 2 per cent.).
*Oleum Adipis* (U. S. P.).—Lard-oil.
*Adeps Dehydratus*.—Purified, dehydrated Lard (for ointments).

**Pharmacology.**—Lard is the prepared internal fat of the abdomen of Sus scrofa, Linné (class, Mammalia; order, Pachydermata), purified by washing with water, melting and straining, The specific gravity of lard is about 0.938. It is entirely soluble in ether, benzine, and disulphide of carbon. It melts at or near 95° F. to a clear, colorless liquid. It consists chemically of 62 per cent. of olein, or fluid fat, and 38 per cent. of the hard fats, palmitin and stearin. The olein may be separated by pressure, or by boiling alcohol. The salt with which it is frequently impregnated may be removed by boiling the lard with twice its weight of water. The tendency to rancidity may also be overcome by digesting the lard with beta-naphthol or poplar-buds. As a convenient animal fat, it is largely used in pharmacy as the basis of ointments and cerates; and in domestic practice it is universally employed as a lubricant. By the addition of benzoin the lard is prevented from becoming rancid, and an agreeable odor is imparted to it; dehydrated lard is preferred where the presence of water is considered objectionable. Lard-oil is sometimes used for illuminating purposes, and can be administered, in cases of corrosive poisoning, as an antidote, except where phosphorus or carbolic acid has been swallowed. Lard is an article of food, or, more correctly, is largely employed in preparing other articles of food.

**Therapy.**—Lard has more penetrating power than petrolatum or vaseline, and active agents (such as mercury, or the alkaloids) can be combined with it for administration by inunction. Washed lard, beaten up with an equal quantity of lime-water, and a few drops of oil of bitter almonds, thymol, or of carbolic acid added, makes an elegant substitute for Carron oil as a dressing for burns, or for some acute inflammations of the skin. Stiffened with a little yellow wax, it forms the simple ointment of the pharmacopœia. This preparation is well adapted to fulfill the general indications of a fat, and to serve as an excipient for more active ingredients. When the secretory functions of the skin are suppressed, inunction with lard serves as a partial substitute for the natural secretion, softens the hard tissue, and reduces its heat. It sheaths the surface, and prevents the contact of the atmospheric air with its floating germs. It lessens or prevents the effect of irritant discharges. Lard softens and removes scabs. Simple ointment relieves the intense heat of the skin and itching in scarlatina. At the same time it assists in reducing the pulse-rate and temperature of the body. Inunction is likewise of value in measles.

**ADEPS LANÆ HYDROSUS** (U. S. P.).—**Hydrous Wool Fat. Lanolin.**

**Pharmacology.**—In the washings of wool is found a variety of fat which, owing to the presence of cholesterin, combines readily with more than its own weight of water; it does not become rancid and resists saponification. It is neutral and is a good vehicle for remedies to be used by inunction, as it passes readily through the skin; it is not adapted as a protective for the same reason. The sheepy smell of the fat is removed by repeated washings, and pure lanolin is now obtainable that is nearly odorless.

Lanolin used as a medicament contains from 25 to 30 per cent. of water, which is not, however, chemically combined, and is readily expelled by heat. Anhydrous lanolin is completely soluble in ether, benzol and chloroform, sparingly soluble in stronger alcohol and insoluble in water. Purified lanolin is of an unctuous, tenacious consistence and whitish color. Dr. A. Gottstein, of Berlin, has demonstrated that lanolin is indestructible or impermeable by micro-organisms. Its employment may, therefore, be regarded as an aseptic measure.

**Physiological Action.**—Lanolin has a soothing action on a delicate or irritable skin. It is not used internally, but only as an unguent.

**Therapy.**—Lanolin is a serviceable dressing in cases of burns, scalds, erysipelas, frost-bites, erythema and dermatitis. Its property of absorbing water, its blandness and aseptic nature, render it an excellent medicament or base in acute eczema. In chronic eczema with infiltration and in psoriasis, lanolin softens the skin and favors the action of remedies with which it may be combined. Lassar highly recommends it in the treatment of impetigo contagiosa. When suitably diluted and perfumed it is an admirable toilet pomade. It rapidly heals chapped hands and lips, and may be spread upon the face before retiring at night in order to soften the skin after exposure to cold and wind. Lanolin, in conjunction with appropriate internal remedies, restores the lustre or gloss of the hair when it has been lost in consequence of systemic disease. It is valuable in the treatment of atrophy of the hair, and counteracts that dry, harsh condition of the hair which is natural to some individuals. Senile atrophy of the skin may be benefited by the persistent and systematic use of lanolin. Inunction with this substance is one of the best means at our disposal for the obliteration of wrinkles. Lanolin favors the proper performance of the glandular functions of the skin, and is efficacious in anidrosis, and comedones. In ichthyosis and scleroderma it softens the surface of the integument. It is an excellent vehicle for the parasiticides made use of in tinea versicolor, tinea favus and the varieties of tinea trichophytina. It is admirably adapted to serve as an ointment basis for the oleate of mercury or copper in the treatment of the affections specified. On account of the ready miscibility of lanolin with mercury and its penetrative power it is peculiarly serviceable in the inunction treatment of syphilis. In affections of the nasal and genito-urinary tracts lanolin is often of great advantage combined with cocaine hydrochlorate.

**Therapy.**—It is a good vehicle for the anodynes,—atropine, cocaine, morphine, etc.,—in cases of neuralgia or rheumatic joints. As an ointment alone for the eye, lanolin is too thick, tenacious and sticky, and to remedy these defects a combination of 1 part of benzoinated lard to 3 parts of lanolin has been preferred; this makes a fine, smooth ointment, which has been found a good vehicle for eye ointments, and, even alone, is often used to apply at night to the eyelids in conjunctivitis and almost all external inflammations. Lanolin containing a large proportion of water is efficient in relieving the itching which accompanies measles, scarlet fever and chicken-pox. The gradual evaporation of the water produces a cooling effect upon the skin. In these affections Dr. Klein adds to an ounce of pure anhydrous lanolin 3 drachms of vaseline and 5 fluidrachms of distilled water. Liebreich recommends the injection of a lanolin-cream into the bowel for the relief of inflammation and erosions of the rectum and hæmorrhoids. Lanolin seems to heighten the efficacy of many of the drugs for which it is employed as an ointment-base. This is especially the case as regards chrysarobin. Applied upon a bougie it has been found of advantage in the treatment of gonorrhœa.

**ADHATODA JUSTICIA.***—**Adhatoda vasica, A. gendarussa,** or **A. pubescens.**

**Pharmacology and Physiological Action.**—The leaves of this plant (belonging to the Acanthaceæ, indigenous to India and neighboring islands) have been used with asserted benefit in pulmonary and catarrhal affections. It contains an alkaloid, **Vasicine,** combined with adhatodic acid. Hooper found it poisonous, when used in infusion, to flies, frogs, and all the smaller organisms, but harmless to arge animals.

**Therapy.**—In asthma, 10-grain doses of the powdered leaves, given three times daily, afford great relief, the patient being also permitted to smoke the leaves in a pipe, or to inhale the smoke. On account of its bactericidal properties, Dr. H. H. Rusby has recommended its use in diphtheria, and it has been suggested that it might also be efficient in typhoid fever, and by inhalation of the spray from the atomizer in cases of phthisis and fetid bronchitis. It is probable that it might also be useful in infectious dyspepsia due to the abnormal fermentation of food in the stomach.

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* Annual of the Universal Medical Sciences, 1890, vol. v, p. A-7.

### **ADONIS VERNALIS.—False Hellebore** (Pheasant's Eye).

*Preparation.*

*Adonidin.—Dose,* gr. $\frac{1}{20}$-$\frac{1}{5}$.

**Pharmacology.**—Adonis is a perennial herb (belonging to the Ranunculaceæ), indigenous to Europe, having bright, showy flowers. There are two species, the A. vernalis, flowering in May, and the A. autumnalis, flowering in September; the former has yellow the latter red, flowers.

**Physiological Action.**—The active principle, **adonidin,** appears to be a glucoside (although it has been asserted that this is not a simple but a compound body, containing picro-adonidin, a glucoside, and other undetermined substances). Adonidin is a yellowish-white, hygroscopic, bitter powder, devoid of odor, soluble in water and alcohol, insoluble in ether, chloroform and benzine.

Merck has isolated a crystalline principle termed adonite, which has been shown to be a pentahydric alcohol, converted into a sugar by oxidation. Adonite is very soluble in water and has a slightly sweet taste, but, according to Kobert, has no decided physiological action. Whether used, as the peasants of Russia are said to be in the habit of doing, as an infusion, the fluid extract, or in the form of adonidin, adonis acts upon the heart as a stimulant or cardiac tonic, resembling in its action digitalis or strophanthus. Adonis is said to increase the arterial tension and in large doses causes diastolic arrest of the heart. In large doses the first rise is succeeded by a decided fall of arterial pressure with paralysis both of the heart and blood-vessels.

It is claimed that, in moderate doses, adonidin is devoid of danger from cumulative effect, and that it agrees with the digestive organs. Huchard, however, found in some cases that it caused vomiting or diarrhœa. In a case in which three grains of adonidin were taken by mistake, vomiting and diarrhœa were prominent symptoms. The action of this drug is very promptly manifested. In accordance with the observation that it increases arterial pressure, there is an increased flow of urine, but adonidin is said to have no effect upon the secreting structure of the kidneys.

**Therapy.**—Internally in cases of mitral or aortic regurgitation it is claimed to be of great value. In functional irregularity of the heart, Da Costa has found much benefit from adonidin (in doses of gr. $\frac{1}{20}$ to $\frac{1}{5}$ thrice daily). In cardiac asthma it also affords relief to the dyspnœa. The fluid extract (normal) is a good preparation in doses of ♏j or ij cautiously increased.

Professor Bekhtereff has observed a favorable influence from the addition of adonis vernalis to a bromide solution in the treatment of epilepsy. The combination which he has for several years employed is:

| | |
|---|---|
| ℞ Potass. bromid., | ʒ ij–iij. |
| Tinct. adonis, | f ʒ j. |
| Codein., | gr. iij. |
| Aquæ, | f ℥ viij. |

M. ft. sol. Sig.: Tablespoonful from four to eight times a day.

The tincture of Adonis æstivalis, an allied species, in 10-drop doses three times a day, is reported to be efficient in removing fatty tissues from the heart and relieving the dyspnœa which accompanies obesity.

**ÆSCULUS HIPPOCASTANUM.—Hippocastanum, Horse-Chestnut Bark.**

**Dose,** fʒi–ij, in fluid extract.

**Pharmacology and Therapy.**—The horse-chestnut, Æsculus hippocastanum (Hippocastaneæ), is a large tree cultivated in Europe and North America as a shade-tree; its original habitat is unknown. The bark contains tannic acid and two neutral bitter principles—**Æsculin** and **Fraxin.** The effects are those of the vegetable bitters; it has some antiperiodic powers. A fluid extract, with dilute alcohol, is the best preparation. The fluid extract has been administered in malarial disorders and in neuralgic affections in doses of ♏xx–fʒj. Æsculin occurs in the form of brilliant white crystals and is soluble in hot water. It is said to have been given with good result as a substitute for quinine in malarial fevers, especially of the remittent form. Æsculin yields æsculetin as a product of decomposition, and from æsculin is derived æscorcin, by means of which, according to Froelich, abrasions of the cornea and conjunctiva may be readily detected. A drop of a 10- to 20-per-cent. solution of æscorcin produces upon these parts a red stain, which lasts for ten or twenty minutes. The red spot is more conspicuous than the green discoloration produced by fluorescin. The application does not cause pain.

**ÆTHER** (U. S. P.).—**Ether.**

*Preparations.*

*Oleum Æthereum* (U. S. P.).—Equal parts Ether and heavy Oil of Wine.

*Spiritus Ætheris* (U. S. P.).—Spirit of Ether.

*Spiritus Ætheris Compositus* (U. S. P.).—Compound Spirit of Ether, or Hoffmann's Anodyne (composed of ether, alcohol, and ol. æthereum). *Dose,* f ʒ ss–ij.

*Spiritus Ætheris Nitrosi* (U. S. P.).—Spirit of Nitrous Ether. *Dose,* f ʒ ss–j.

**Pharmacology.**—Ether is a thin, very diffusive, clear and colorless liquid, with a refreshing, characteristic odor, a burning and sweetish taste, after-taste slightly bitter, with a neutral reaction. It is soluble in all proportions in alcohol, chloroform, benzol, benzin, fixed and volatile oils; dissolves in about ten times its volume of water at 59° F., and it boils at 98.6° F. It is very inflammable, and its vapor, mixed with air and ignited, explodes violently. The vapor is slightly irritating to the conjunctivæ, and at first to the bronchial mucous membrane.

**Physiological Action.**—When ether is poured over the skin it evaporates so quickly that a sensation of cold is experienced, and when its application is continued, as with the atomizer, the temperature of the part is lowered and it may be frozen, which is announced by sudden blanching of the skin. When the escape of the vapor is prevented ether acts as a counter-irritant, causing reddening; even vesication may be produced.

When taken internally, ether is a diffusible stimulant, like alcohol in its effects; although they are manifested earlier by ether, yet they are more transitory than when produced by spirits. When introduced into the circulation, by absorption from the stomach or the rectum, by inhalation, or hypodermically, it is found to increase arterial tension and acts as a cardiac stimulant, the heart continuing to beat after failure of respiration. In these respects it is antagonistic to chloroform, which lowers arterial pressure and is a cardiac sedative. Ether-vapor is inhaled pure, while chloroform-vapor must be combined with 95 to 97 parts of atmospheric air. Upon the nerve-centres ether acts very much like alcohol, affecting (1) the cerebrum; (2) the sensory, and later the motor, functions of the spinal cord; (3) the sensory centres in the medulla oblongata; and (4) finally the motor centres in the medulla.

**The State of Anæsthesia.**—Anæsthesia produced by the inhalation of ether-vapor, when complete, nearly approximates the state of coma. It approaches by well-defined stages, the first being one of excitement or exhilaration; the second is narcosis; the third is abolition of sensibility and reflexes, and, carried further, it ends in paralysis and death from failure of respiration, owing to paralysis of the centres in the medulla oblongata. The nerve-centres are affected in the following order: The higher centres in the brain, the motor and sensory centres in the medulla spinalis, and, ultimately, the sensory and motor centres of the medulla oblongata. The vapor of ether is at the beginning of the inhalation irritating to the air-passages, and may cause strangling sensations to the patient, but this soon passes away as anæsthesia becomes established; it may be necessary, at the outset, to allow some admixture of air, so as not to frighten the patient, but as soon as may be possible the pure ether-vapor is to be administered, so as to prevent efforts at vomiting. Owing to this irritation of the bronchial mucous membrane there may be produced congestion or œdema of the lungs, especially when the patient is not kept warm during the operation.

The presence of bronchitis contra-indicates the use of ether. According to the observation of Poppert, œdema of the lungs is the frequent immediate cause of death from ether and is due to the toxic influence of the anæsthetic. Senger draws attention to the danger of cerebral hæmorrhage during ether narcosis in patients suffering from arterio-sclerosis. During operations upon the mouth, and particularly in the extraction of teeth, the blood running down the throat, Dorr says, may cause spasm of the glottis, respiration becomes thus interfered with, and death may result. Blood passing from the mouth into the throat, he further adds, may bring on vomiting, which may speedily lead to asphyxia unless the operator stops for a few moments and cleanses out the parts. A few "dont's" should be borne in mind when administering ether:—

1. Don't give it to a patient whose kidneys are diseased.

2. Don't give it when the stomach contains undigested food; the patient should be fasting.

3. Don't give it without removing artificial teeth from the mouth, as they may fall into the throat.

4. Don't give it unless the clothing is so loose as to allow freedom of respiration.

5. Don't give it when the pleural cavity is full of fluid.

6. Don't give any anæsthetic to women, especially young women, except in the presence of witnesses, who can testify as to your actions during the period of unconsciousness of the patient, as under such circumstances women sometimes acquire fixed delusions which can only be met by testimony absolutely proving their falsity.

7. Don't forget that ether-vapor and air make an inflammable and explosive mixture, and that ether may take fire from the actual cautery as well as from a candle.

8. Don't forget that there are different qualities of ether, and that the proper kind for surgical purposes is the official ether.

9. Don't forget that ether, like alcohol, lowers temperature, and that the patient should not be too much exposed to cold during operation.

10. Don't forget that ether causes death by respiratory failure, and that the color of the lips and ears is a better guide to the state of the blood than the radial pulse.

11. Don't forget that the anæsthetic state is a state of danger, and the patient is not safe until the effects of the ether have entirely passed off.

12. Don't forget that ether is eliminated rather slowly by the lungs and the kidneys; so the patient should be watched for several hours after the administration.

**The Choice of Anæsthetics.**—The anæsthetic agent should be suited to the operation and to the circumstances of each case. For many trivial operations, or those which are rapidly performed, pure nitrous oxide gas is sufficient and much safer than the others. In young children, chloroform-vapor is easier of administration than ether, and comparatively free from danger when properly administered; it also is preferred where the actual cautery is to be used, or where lights are required near the patient. In midwifery practice it also is the preferred anæsthetic. For all ordinary cases ether is safer than chloroform, and is by far the most frequently used. As the result of a collective investigation among German surgeons Gurlt, reports that ether was administered 14,506 times without a death.

A valuable paper has been published * by Dr. Julliard, of Geneva, upon the relative safety of ether and chloroform. From the records of several hundred thousand administrations of ether and chloroform it was shown that the mortality from the latter is from four to five times greater than from ether. Methylene bichloride has been tried in England to some extent, but as ordinarily sold it appears to be merely an impure chloroform. Ethyl bromide is of more recent introduction, and when pure answers well for short operations, but does not have decided advantages over the best ether except in having a slightly more agreeable odor. For a lengthy operation it is well to supplement the action of the anæsthetic and stimulate the circulation by the preliminary administration of from 2 to 4 ounces of whisky. In a similar manner a hyperdermic injection of morphine (gr. $\frac{1}{4}$) and atropine ($\frac{1}{120}$) may be given before operating (Nussbaum's method). Various mixtures of anæsthetics have been proposed, the best known being the A. C. E. mixture of the London hospitals, containing alcohol 1, chloroform 2, and ether 3 parts; but owing to the different density of the vapors of the several substances and the unequal boiling or vaporizing point and varying rates of diffusion, it is impossible to tell just how much of each is being given; and, therefore, these mixtures are not recommended. Gurlt has collected a large number of statistics of the administration of anæsthetics and finds that when a mixture of agents was used the proportion of accidents from asphyxia was greater than when chloroform alone was employed.

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* *Revue Médicale de la Suisse Romande*, February, 1891.

Where a patient dislikes ether, or takes it badly, the administration may commence with nitrous oxide and ether substituted later, or it may be preceded by a few whiffs of chloroform. Dr. A. Diaz de Liaño has invented an apparatus by means of which ether can be administered at a temperature of 88° F., and claims that by his method the disadvantages both of cold ether and chloroform are obviated.

**Treatment for Toxic Effects.**—When a patient is too deeply narcotized or appears asphyxiated by the ether, artificial respiration, inhalation of ammonia, slapping the exposed surface of the chest with wet towels, and the faradic current will usually restore him. Rubbing the body so as to keep up the circulation, or the use of stimulating enemata, is also of service. Oxygen might be administered if at hand, or 2 atoms of oxygen with 1 of nitrogen monoxide, or amyl nitrite inhaled so as to flush the brain and medullary centres with blood, or nitro-glycerin (gr. $\frac{1}{100}$) given hypodermically.

What is called "primary anæsthesia" occurs early in the administration of the ether, at the time when narcosis begins. During this stage, which is very brief, small operations, incisions, punctures, etc., may be done without waiting for complete anæsthesia. In order to ascertain when it occurs, the patient is directed to extend one of his arms perpendicularly upward and to hold it up as long as he can. At the moment when narcosis occurs the arm falls, which is the signal for the operator to cut and for the administration of ether to cease. The patient regains consciousness at once, and generally there is no vomiting or other ill effects.

**Ill Effects of Ether.**—The unpleasant results which sometimes follow the administration of ether, such as nausea and vomiting, may be overcome by giving the patient a cup or two of either strong, hot coffee or tea. Dorr states that often the bad effects of ether may be avoided by the patient keeping the eyelids closed for a time after regaining consciousness and interdicting the use of water, either to wash out the mouth or to drink. In explanation he states that he has observed, in many cases after etherization for operations, especially in extracting teeth, nausea and vomiting follow from the employment of water. In the event of nausea, vomiting, or even wakefulness supervening, Dr. Dorr administers about

25 grains of potassium bromide in strong coffee. At times the same authority gives from a few drops to a drachm of compound spirit of ether in water.

The author can also commend sodium bromide (15 to 20 grains, in soda-water, soda-mint-water, or cinnamon-water), camphor-water, the aromatic spirits of ammonia, caffeine citrate or hydrobromate (1 to 4 grains at a dose), tincture of capsicum (10 to 20 drops at a dose), or the effervescent salts of sodium or caffeine bromide, all of these being especially suitable for the treatment of the ill effects following the administration of ether. In order to control hiccough and vomiting during anæsthesia, Dr. Bernard Joos is in the habit of making digital compression of the phrenic and vagus nerves against the sternal end of the clavicle. He states that, as a rule, vomiting immediately ceases. The pressure is continued for a few moments in order to prevent a return of the sickness.

**Therapy.**—Ether may be used locally for its refrigerating effects. In strangulated hernia the persistent dropping of ether upon the tumor sometimes causes spontaneous reduction. It dissolves fat from the skin, and is applied to wash the surface before a surgical operation, after using soap. The ether-spray may be used to benumb a part of the skin before making an incision; and, in chorea, ether-spray has been applied to the spine with good results. The ether-spray is also often very serviceable in allaying the pain of neuralgia, especially when seated in a superficial structure. The ether is directed immediately upon the course of the aching nerve. Sir James Sawyer points out that ether is the best menstruum for the solution of many remedies to be used upon the skin. Ether is a good solvent of the active principles of many drugs and also of sebaceous matter. The liquid may be used for making ethereal tinctures or liniments. In strangulated hernia 1 or 2 fluidounces of ether may be sprayed upon the tumor, as successfully employed by Finklestein* and Gussenbauer.

A case in which a fistula remained after an operation for cholecystotomy has recently been described by Dr. John W. Walker. Seven months later a stone again entered the duct and was dissolved by a mixture of equal parts of ether and glycerin placed in a small glass tube attached to a syringe, the tube passed directly upon the stone and the ether-glycerin injected drop by drop.

Ethereal preparations may be used internally for hysteria, colic, and the passage of biliary or renal calculi. Durand's remedy for gall-stones is equal parts of ether and turpentine-oil, given a teaspoonful at a dose.

Ether is a diffusible stimulant, and can be used hypodermically in heart-failure (♏xx–xxx). Taken with water or syrup (ʒss–j), it affords relief in flatulence, spasmodic asthma, or colic. It has similar effects to those of alcohol, and a habit of ether-drinking† has in like manner been established in some persons (although the odor of the breath plainly announces to others the fact that it has been taken), but its effects are more transitory than those of alcohol.

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* Treatment of Strangulated Hernia by applications of ether, after the method of Finklestein.—*Gazette médicale de Strasbourg*, No. 3, March 1, 1895.

† See interesting address on "Ether-Drinking, its Prevalence and Results," by Ernest Hart, delivered before the Society for the Study and Cure of Inebriety, in the *Provincial Medical Journal*, November 1, 1890.

The internal administration of ether is capable of relieving mild attacks of angina pectoris. It is a good plan to combine 10 or 20 drops of ether with codliver-oil when the latter substance is not well borne. Ether facilitates the digestion and absorption of the oil, probably by increasing the secretion of pancreatic fluid. Hoffmann's anodyne in half-drachm doses is useful in sick-headache. The hypodermic injection of from 15 minims to ½ drachm of ether in the neighborhood of the affected nerve has proved of value in sciatica, gastralgia and various forms of rheumatic neuralgia. Barth obtained very excellent results in typhoid pneumonia from the subcutaneous injection of 15 to 20 minims of ether. The injections were given from two to four times daily, and were followed by notable increase in the strength and volume of the pulse. Castel reports favorably of the same method in small-pox. After puerperal, pulmonary, or other severe hæmorrhage, ether thrown under the skin stimulates the heart and may avert fatal syncope.

The following combinations of ether will be found serviceable:—

| | |
|---|---|
| ℞ Spts. ætheris comp., | f℥ij. |
| Tinct. capsici, | fʒj. |
| Spts. ammon. arom., | ♏cc. |
| Aqua sodæ menth., | f℥ij. |

M. Sig.: A teaspoonful in water every few minutes until relieved. This prescription is especially useful in the treatment of syncope, flatulence, and nervous or hysterical paroxysms.

| | |
|---|---|
| ℞ Spts. ætheris comp., | |
| Elix. lupulini, | |
| Tinct. valerian. ammon., | āā f℥j |

M. Sig.: Two teaspoonfuls in water every fifteen or twenty minutes. For hysteria and nervous sick-headache, neurasthenia, angina pectoris, and spasmodic asthma.

*Spiritus Ætheris Compositus.* In hysteria, flatulent colic, and nervousness, this solution is much in demand. Hoffmann's anodyne is likewise very serviceable in the treatment of hiccough, functional palpitation of the heart, or syncope. It will often afford relief in gastralgia, and will sometimes prove of marked benefit in angina pectoris.

It is a diffusible stimulant and antispasmodic.

The following formulæ, containing compound spirit of ether, are useful:—

| | |
|---|---|
| ℞ Sodii bicarbonatis, | ʒiss. |
| Spts. ammon. arom., | |
| Tinct. zingiberis, | āā fʒj. |
| Spts. ætheris comp., | f℥iv. |

M. Sig.: Two teaspoonfuls in water for hysteria or flatulence. Repeat when necessary.

| | |
|---|---|
| ℞ Spts. ætheris comp., | |
| Vini cocæ, | āā f℥ij. |

M. Sig.: From one-half to a tablespoonful in water every hour or two as a stimulant.

*Spiritus Ætheris Nitrosi* (spirit of nitrous ether, sweet spirit of nitre) is an alcoholic solution of crude ethyl nitrite (5 per cent.), made by the action of sulphuric and nitric acids upon stronger alcohol, and consists chemically of alcohol, aldehyd, water, ethyl acetate, and pure ethyl nitrite (at least 4 per cent. of the last-named constituent). Upon the human system it acts as a diaphoretic and diuretic, and the ethyl nitrite acts as a sedative upon the circulation, especially when fever is present. The pharmacopœia directs that it should be kept in small, glass-stoppered bottles, in a dark place remote from lights or fire. Very much of the spirit of nitrous ether has not been properly kept, is deficient in strength, and has become acid from age. When this has occurred it should not be used. The loss of the ethyl nitrite is prevented to a large extent by a combination with an alkali or ammonia acetate or citrate. When good it renders excellent service as a diuretic, especially in scanty secretion of urine in elderly people.

Nitrous ether resembles the other nitrites in its sedative effects upon the system, but its action is overcome or modified in this form by the comparatively large quantity of alcohol accompanying it, which really makes the spirit of nitrous ether a diffusible stimulant. For this reason Whitla especially commends it in the dropsy of debilitated subjects. In fever it may be given (ʒss–j) in cold water or lemonade, or in combinanation with other remedies, as aconite or veratrum viride. It is widely used in fever, acts upon the skin as well as upon the circulation, and reduces the temperature. It is useful, above all, in the febrile affections of infancy and childhood. It enters into Brown Mixture (mist. glycyrrhizæ co.), of which it constitutes 3 parts in 100, forming a popular remedy for acute bronchitis.

Spirit of nitrous ether can be employed in the following combinations with advantage:—

| | |
|---|---|
| ℞ Spts. ætheris nitrosi, | |
| Aquæ camphoræ, | |
| Liq. ammon. acetatis, . . . . . . . . | āā f℥ij. |
| Antimonii et potassii tart., . . . . . . . . | gr. j. |
| Morphinæ sulphatis, . . . . . . . . . . | gr. ss. |

M. Sig.: A tablespoonful in water every hour or two until relieved. For acute bronchitis, acute rheumatism and in fevers.

| | |
|---|---|
| ℞ Spts. ætheris nitrosi, | |
| Elix. humuli, | |
| Syr. lactucarii, . . . . . . . . . . . | āā f℥ij. |

M. Sig.: From a half to a tablespoonful every hour when unable to sleep. Serviceable in insomnia, general nervousness, and debility.

**ÆTHER ACETICUS** (U. S. P.).—**Acetic Ether.**

**Dose,** internally, ♏x-xxx.

Ethyl acetate is soluble in 17 parts of water, and in all proportions of alcohol or chloroform. It enters into cologne and tincture of ferric acetate. It has simliar effects upon the system to ethyl oxide, and also can be used as an anæsthetic, but is slower in its action.

According to the experiments of Krautwig on rabbits, moderate quantities of acetic ether greatly increase the respiratory capacity, the effect augmenting in proportion to the dose. There was no influence from the same quantities upon the blood-pressure and no ill effects upon the heart. Inhalation of the vapor of acetic ether allays laryngeal and bronchial irritation. In nervous cough also it may be used with good effect.

**ÆTHER CHLORICUS.—Chloric Ether, Ethyl Chloride.**

Ethyl chloride is a colorless fluid of an ethereal odor and boils at 50° F. It produces local anæsthesia by its freezing effect. The skin is first reddened, after which it becomes perfectly white and a snow-white coating forms upon its surface. Ethyl chloride is put up in hermetically sealed glass tubes containing 2½ drachms, one end being drawn out into a fine point. When this is broken off the heat of the operator's hand projects a fine spray upon the surface to be anæsthetized. Ethyl chloride has been used successfully to allay the pain of neuralgia, lumbago and migraine. It has also been found serviceable in dentistry. Ethyl chloride is capable of producing general anæthesia, although its effects are very evanescent. It exerts a decidedly depressant influence upon the circulation.

**ÆTHER HYDRIODICUS.—Hydriodic Ether, Ethyl Iodide.**

**Dose,** ♏v–xx, by inhalation.

This is very analogous to ethyl bromide, iodine merely replacing the bromine. It can be administered from a vial in drops on a handkerchief, or by gelatin capsules containing 5 minims each. It is not used for producing anæsthesia, but may be inhaled for syphilis, bronchitis, phthisis, catarrh, whooping-cough, asthma, or other spasmodic disorders.

**ÆTHER HYDROBROMICUS.—Hydrobromic Ether, Ethyl Bromide.** (*Not* Ethylene Bromide.)

**Dose,** f℥j, by inhalation.

**Pharmacology.**—This liquid has rather a pleasant odor and sweetish taste. When pure it is colorless, volatile, non-inflammable, and resembles ether or chloroform in its effects when taken internally or by inhalation. It is very slightly soluble in water, but freely soluble in alcohol and ether, chloroform and oil. Air and moisture cause its decomposition. Under the influence of light the bromine gradually separates, causing discoloration of the ethyl, when it becomes unfit for use, owing to the poisonous effects of bromine.

**Therapy.**—For anæsthesia, the pure ethyl bromide only should be used, as dangerous symptoms, even fatal results, have been ascribed to the use of impure preparations. It is thought that some, at least, of the fatal cases may have been caused by the employment of ethylene bromide in mistake for ethyl bromide. An easily applied test for the purity of ethyl bromide is given by Sternberg: if a drop of ethyl bromide be let fall in a solution of potassium iodide 3 centimetres (about 1¼ inch) deep, it should reach the bottom without being colored violet. In experiments upon animals ethyl bromide has generally proved fatal by arrest of respiration. Kochler, however, has recently reported a case in which death occurred from a sudden cessation of the heart's action. Chemical examination demonstrated that a pure sample had been employed. In other cases, which did not terminate fatally, the inhalation of ethyl bromide occasioned nausea, vomiting, collapse, spasm of the glottis, cyanosis of the face or other distressing symptoms. In some instances irritability of the stomach, loss of appetite and prostration continued for days after the anæsthetic had been given. Dr. Jendritza, of

Berlin, has published a case in which, on the day subsequent to the administration, the patient, after feeling giddy for some hours, fell into an unconscious condition. In some patients extreme excitement has occurred under the influence of ethyl bromide.

In doses it stands between ether and chloroform, and probably occupies the same relative position with regard to safety. Its characteristic effects, when inhaled, are the rapid approach of anæsthesia, its brief duration and the rapid return of consciousness. It is, consequently, ill adapted for use in prolonged operations. When sprayed upon a part it produces local anæsthesia. It may be inhaled in epilepsy, chorea, and other spasmodic diseases (about 1 drachm at a time). Being uninflammable and not unpleasant, it may be used instead of ether for minor surgical operations. One advantage which ethyl bromide possesses is that it does not irritate the mucous membrane of the upper respiratory tract. This agent is not appropriate for use in the reduction of fractures and dislocations, as it is liable to excite muscular spasm. It is unsafe in the case of drunkards and those suffering from disease of the kidneys, heart or lungs. After inhalation of ethyl bromide the breath of the patient has, for two or three days, an odor similar to that of garlic.

From a series of experiments relative to the action of ethyl bromide L. Guinzbourg concludes that small quantities produce narcosis without affecting arterial pressure. Large amounts diminish blood-pressure by paralyzing the peripheral vaso-motor constrictor system. It is without effect upon the central vaso-motor dilator system, or upon the vagi. Toxic doses disturb the action of the heart, but produce arrest of respiration before that of the heart. The same precautions should be taken in administering ethyl bromide as when giving chloroform.

**Ethylene Bromide.**—This fluid has at first a sweetish and subsequently a burning taste, and an odor which resembles that of chloroform. It dissolves in water and mixes with oil or alcohol. Ethylene bromide has been used with success in a number of cases of epilepsy as a substitute for potassium bromide. The dose for adults is from 3 to 8 drops thrice daily, and can be gradually and cautiously increased to 30 drops two or three times a day. It can be administered in wine or in capsules.

**Coryl.**—Under this name a mixture of methyl chloride and ethyl chloride has been employed as a local anæsthetic in dentistry and minor surgery. Though it does not produce as much cold as methyl chloride, it has the advantage of being a fluid at 32° F., while the latter boils at a much lower temperature.

## ÆTHER VALERIANICUS.—Valerianic Ether.

**Pharmacology and Therapy.**—Valerianic ether, or the ethylic ether of iso-valerianic acid, is a colorless fluid, having an odor resembling that of valerian. It is a less volatile fluid than ordinary ether. The dose of valerianic ether is 2 minims, but in practice it is found preferable to dilute it with sulphuric ether, and it is thus prepared and put up in gelatin capsules by M. Vial, each capsule containing about 4 drops. Valerianic ether is a serviceable remedy in dysmenorrhœa, nervous headache and excitement, asthma and other spasmodic disorders, neuralgia, and nervous vomiting. It is of advantage in mania à potu by controlling arterial and nervous excitement and tremor. In periodic hay fever Dr. J. D. Christman, of Allentown, Pa., has found it decidedly useful.*

**AGARICUS ALBUS.**—**Purging Agaric.** (Polyporus officinalis, Boletus laricis; order, Basidiomycetes, Hymenomycetes.)
**Dose,** gr. x–xxx.

*Preparations.*

*Agaricin.—Dose*, gr. $\frac{1}{12}$–j.
*Extractum Agarici.—Dose*, gr. iii–vj.
*Tinctura Agarici.—Dose*, ♏xx–lx.

**Pharmacology.**—The European larch has a fungus which grows in large, hoof-shaped masses horizontally from the trunk, and penetrates, with its mycelium, deeply into the wood. The masses are collected in Europe and Asia Minor, and, after peeling and drying, they form yellowish-white, friable, spongy, irregular balls, from the size of an orange up to that of a cocoa-nut. It has a heavy, fungus-like odor, a sweetish, followed by a bitter, nauseous taste, and its powder is irritating to eyes and nose. It largely consists of resinous matter, **Agaricin.** In doses of gr. x or more it acts as a purgative, in small doses is tonic and anhydrotic.

**Physiological Action.**—In small doses (gr. i–v) agaricin acts like atropine, but does not dilate the pupil. It is a compound body, the active principle of which is termed agaric acid. (Hoffmeister has shown that the substance employed under the name of agaricin or agaric acid is an impure product.) Pure agaric acid is a white, light, crystalline powder, of a silky lustre. It crystallizes out of absolute alcohol in groups of tuft-like needles or as distinct rosettes. Its melting-point is 138° C. (280.4° F.). The free acid is but slightly soluble in cold water, but is moderately soluble in boiling water. Its alkaline combinations are freely soluble, but its heavy metallic salts are insoluble. It is a strong local irritant, and its subcutaneous injection results in active inflammation with the production of pus. On account of its slow absorption, it produces no grave symptoms in warm-blooded animals. The subcutaneous or intra-venous injection of a soluble salt first excites, and then paralyzes, the vagus and vaso-motor centres. Death is preceded by convulsions, and results from cessation of respiration or, in animals when artificial respiration is kept up, from the extreme fall of blood-pressure. The influence upon the secretion of sweat is not central, but is exerted upon the secretory glands.

It, therefore, becomes a matter of prime importance that pure agaric acid should be employed. The pure acid is little liable to excite vomiting and purging, and it is well borne in doses of from $\frac{1}{3}$ to $\frac{1}{2}$ grain. Since its anhydrotic activity appears gradually, small doses, given repeatedly, will be free from the unpleasant consequences which might follow a single large dose.†

**Therapy.**—Agaricin, in doses of gr. $\frac{1}{12}$–j, is used to check night-sweating, and sometimes to suppress lactation.

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* *Medical Bulletin*, January, 1892.

† *Deutsche Med. Wochenschr.*, September 10, 1889; *Medical Bulletin*, January, 1890.

| | |
|---|---|
| ℞ Agaricin., | gr. j. |
| Acid. sulph. aromat., | f ʒ iv. |
| Elixir, | f ℥ iss. |

M. Sig.: Take one drachm every four hours in water.

Agaracin also suppresses perspiration due to other morbid causes. A solution of agaric in alcohol has been suggested as of value in hyperidrosis. It has been also recommended to combine a small quantity of Dover's powder with each dose of agaricin, when there is a tendency to looseness of the bowels following its use. Powdered agaric in small doses has been employed for the purpose of diminishing bronchial secretion and is said to arrest diarrhœa and dysentery.

In order to reduce the fever and restrict the night-sweats of pulmonary tuberculosis Professor J. M. Anders sometimes resorts to the following combination:—

| | |
|---|---|
| ℞ Quinin. sulphat., | gr. xxiv. |
| Antipyrin., | gr. xxiv. |
| Agaricin., | gr. jss. |

M. et ft. capsulæ no. xij. Sig.: One capsule three times a day.

**AGARICUS CHIRURGORUM.—Polyporus Igniarius.**

This is an allied fungus to the preceding, but is used solely on account of its porous texture. It has been employed as a mechanical hæmostatic and for its slow burning as a moxa. It may be soaked in potassium nitrate or chlorate solution, which makes it more inflammable.

**AGARICUS MUSCARIUS.—Amanita Muscaria,** or **Fly-Fungus** (Basidiomycetes, Hymenomycetes).

### *Preparations.*

*Muscarina.*—Muscarine. *Dose,* gr. ⅛–ij.

*Muscarinæ Nitras.*—Muscarine Nitrate. *Dose,* gr. 1/12–j.

**Pharmacology.**—A poisonous mushroom, consisting largely of fungus-cellulose. Its active principle is a syrupy alkaloid, **Muscarine.** It is without taste or odor, but produces powerfully intoxicating effects somewhat analogous to pilocarpine in its action, and antagonized by atropine. The alkaloid is soluble in water, and mushroom poisoning may be prevented by soaking the mushrooms in water slightly acidulated with vinegar. In cases of poisoning, Whitla has successfully used atropine and diffusible stimulants. Digitalis may also be given hypodermically, and stimulating enemata administered.

**Physiological Action.**—The action of the heart and the respiratory movements are diminished by large doses, the heart being finally arrested in diastole. Smaller doses diminish blood-pressure and reduce temperature, although the bodily heat may be secondarily increased. The secretions of the skin, the liver, and intestinal tract are increased, while that of the kidneys is sometimes reduced or suppressed. The muscular system is relaxed, but convulsions may occur from accumulation of carbonic acid in the blood. Upon the brain a marked narcotic or stupefying effect is observed, so that it has been used in Asia as an intoxicant. The pupil contracts from the effects of the internal administration, while the local application of muscarine may cause dilatation.

**Therapy.**—Administered medicinally, muscarine has some reputation in checking the fever and sweating of phthisis. It may be used in affections of the respiratory tract where there is deficiency of secretion, or in disorders of the alimentary canal where the same indication is to be met, and to overcome a tendency to constipation. Muscarine can therefore be combined with such drugs as belladonna, hyoscyamus, strychnine, aloin, cascara, sagrada, or sulphur, with advantage, as in the following formulæ:—

| | |
|---|---|
| ℞ Muscarinæ, | gr. iij. |
| Ext. ignatiæ, | gr. j. |
| Aloini, | |
| Ext. belladonnæ folior. alc., | āā gr. iss. |
| Ext. gentianæ, | gr. xvj. |

M. et ft. pil. no. xvj.

Sig.: One pill two or three times a day. Beneficial in constipation and in catarrhal jaundice.

| | |
|---|---|
| ℞ Muscarinæ, | gr. iiss. |
| Ext. hyoscyami, | gr. iss. |
| Ext. cascaræ sagradæ, | gr. iv. |
| Sulphuris subl., | ʒ iss. |

M. et ft. capsulæ no. xvj.

Sig.: A capsule three times a day. Serviceable in constipation and in hæmorrhoids.

In diabetes mellitus and polyuria, muscarine has been tried in common with many other agents but without constant good results.

The dose of muscarine is usually gr. $\frac{1}{8}$–ij, in solution, or muscarine nitrate may be given in somewhat smaller doses. For the sweating of phthisis, Murrell uses a 1-per-cent. solution, of which the dose is 5 minims.

## AGATHIN.

**Dose,** 5 to 10 grains.

**Pharmacology.**—Agathin is the name bestowed upon a new synthetical compound discovered by Dr. Israel Roos, of Frankfort-on-Main. It is a derivative of salicylic acid and its chemical composition is expressed by the title salicyl-a-methylphenylhydrazin.

Agathin occurs in the form of small, light green, crystalline scales, destitute of smell or taste, insoluble in water, soluble in alcohol and ether and melting at 74° C. (165° F.).

**Physiological Action and Therapy.**—Moderate doses have no ill effect upon animals. When administered to the human subject, agathin generally increased the appetite and excretion of perspiration. It was found beneficial clinically in neuralgia and rheumatism, being generally given in the dose of 8 grains two or three times a day. Its effect was not immediately exerted and its use does not usually appear to be accompanied by any drawbacks. On the contrary, Ilberg and Badt have observed cases in which agathin gave rise to headache, vertigo, insomnia, vomiting, diarrhœa, thirst, sensation of heat and smarting pain during micturition.

## AILANTHUS GLANDULOSA.—Ailanthus-Tree, Chinese Sumach.

**Pharmacology.**—The Ailanthus, or Tree of Heaven (belonging to the natural order Simarubaceæ), has been brought from China, and is now naturalized in this country as a shade-tree. The inner bark, which is the part used, contains an oleoresin and a volatile oil.

The fluid extract (dose, ♏x–ʒj) and the tincture (in doses of ʒss–ij) are not official, but have been used. The bark may be given in doses of from 5 to 10 grains.

**Physiological Action.**—When taken in full doses, ailanthus nauseates and purges; it also gives rise to vertigo, headache, pains in the back and limbs, and prostration, with numbness or tingling. Both respiration and pulse-rate are reduced; death results from arrest of respiration.

**Therapy.**—The fresh bark is used in the treatment of tape-worm, in decoction (ʒiv–Oj) or the oleoresin (in ʒj doses). It has also been used in malignant scarlatina, in spasmodic disorders, and in dyspepsia. An infusion of the leaves has been employed in dysentery.

### ALCOHOL (U. S. P.)—Alcohol, Spirit of Wine.

*Preparations.*

*Alcohol Absolutum* (U. S. P.).—Absolute Alcohol (1 per cent. of water).
*Alcohol Deodoratum* (U. S. P.).—Deodorized Alcohol (7.5 per cent. of water).
*Alcohol Dilutum* (U. S. P.).—Diluted Alcohol (59 per cent. water.
*Spiritus Frumenti* (U. S. P.).—Whisky (contains about 50 per cent. of alcohol).
*Spiritus Vini Gallici* (U. S. P.).—Brandy (contains about 50 per cent. of alcohol).
*Spiritus Myrciæ* (U. S. P.).—Bay Rum.
*Vinum Album* (U. S. P.).—White Wine (10 to 12 per cent. alcohol).
*Vinum Rubrum* (U. S. P.).—Red Wine (10 to 12 per cent. alcohol).

Alcohol is a liquid composed of 91 per cent. by weight (94 by volume) of ethylic alcohol, and of 9 per cent. by weight (6 by volume) of water. Specific gravity 0.820 at 60° F. It is a transparent, colorless, volatile, and inflammable substance, with a characteristic, rather pungent taste and odor.

**Pharmacology.**—The hydrate of the hydrocarbon radical $(C_2H_5)$ is ordinarily understood to be meant by the term alcohol, although many other substances are known to the chemist under this name, none of which, however, are used in medicine,* although the physiological effects have been investigated. Ethylic alcohol also is the alcohol of brandy, whisky, wine, and various spirits and cordials. Its effects upon the organism are transitory and less dangerous than those of other alcohols, such as amylic, methylic, or butylic. During distillation of grain, unless carefully managed, considerable amylic alcohol will pass over with the ethylic, especially if the process be continued too long. By keeping whisky stored for several years, the amylic alcohol becomes changed into various ethers, which impart a flavor to the spirit. The United States Pharmacopœia directs that grain-spirit (whisky) should be at least two years old; and the spirit from fermented grapes (brandy) at least four years old. Wine is made by fermentation without distillation. Red wine is a deep-red alcoholic liquid made by fermenting the juice of colored grapes in the presence of their skins; white wine is of a pale-amber or straw color, and is obtained by fermenting the unmodified juice of the grape, free from seeds, stems and skins. Gin (spiritus Genevæ) is not official: it is obtained by adding juniper-berries to diluted alcohol. Rum, or molasses spirit (spiritus fuscus or Jamaicencis), is made by distillation from sugar or molasses which has undergone alcoholic fermentation; it is about the same alcoholic strength as whisky.

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* If phenol and glycerin are to be considered as alcohols, they are exceptions to this statement.

Alcohol dissolves alkaloids, fatty and resinous substances, and is largely used as a menstruum in obtaining the active principles of drugs in an available form for administration. It is the basis of the (U. S. P.) spirits, tinctures, and elixirs; spirits being solutions of volatile substances in alcohol; tinctures, solutions of active principles of plants, generally obtained by maceration and percolation. An elixir is a cordial flavored with orange and syrup, used as a vehicle for other remedies, and as a stomachic. Malt liquors—ale, beer, porter, etc.—are produced by fermentation of malt and hops, and contain nutritive material, together with a small proportion of diastase, which makes them useful in certain cases of weak digestion. They contain only from 6 to 10 per cent. of alcohol. Malt liquors can be taken by those who suffer from the cerebral effects of wine, but to some they are unpleasant in their effects upon the brain, owing to the oil of hops which they contain (Rossbach).

Absolutely pure alcohol is rarely found, even in the laboratory of the chemist. Owing to its great affinity for water, it will even abstract it from the air. What is known as absolute alcohol of the shops usually contains about 2 per cent. of water. It is a colorless, pleasant-smelling liquid, with a sharp, warm taste. When added to water, heat is developed, and the mixture does not measure as much as the sum of its constituents owing to combination. Besides its affinity for water and its power as a solvent, it has a coagulating action upon albumin, and is an antiferment when in solution, containing at least 18 per cent. of alcohol.

**Physiological Action.**—Owing to volatility, it gives a cool sensation to the skin at first, but afterward, if its evaporation be interfered with, it causes irritation and heat, and, if continued, produces inflammation. It also hardens the integument by abstracting water from it, coagulating some of its albuminoid constituents, and dissolving its fat. It has the same effect upon mucous membranes, thus enabling it to act as an astringent. It has some anæsthetic action, possibly by reducing the congestion by its constringent effects upon the smaller blood-vessels. Flannel wet with hot whisky relieves pain in neuralgia of the face. After alcohol in the strength of ordinary spirits is swallowed, in small quantity (f℥ss–ij), there is a sensation of heat in the epigastrium, which soon diffuses itself over the body. It increases the appetite and the digestive power, causing an augmented gastric juice. If taken in large quantities, appetite is lost and nausea appears, and the digestive power is suspended. As a result of long-continued indulgence in alcohol, the stomach undergoes changes in its coats, new areolar tissue being formed, which, by its subsequent contraction, strangulates the gastric glands; hence, dyspepsia and gastric catarrh, with morning vomiting, are very common among drunkards. In addition to structural change, alcohol in excess precipitates pepsin from the gastric juice, and thus increases digestive difficulties. The experiments of Dr. Beaumont showed that small amounts increased the vascularity of the stomach and stimulated the flow of gastric secretions. Its antiseptic powers are useful in infectious dyspepsia, where digestion is stopped by the growth of micro-organisms, which set up abnormal fermentation in the stomach and intestinal canal. Its acknowledged value in the zymotic diseases, and pre-eminently in diphtheria, is partly due to its antiseptic action in the alimentary tract. In cholera epidemics, alcohol has decided prophylactic effects, and this is not controverted by the fact that persons weakened by debauches and alcoholism are most liable to perish from the disease. In cholera infantum, brandy exerts an excellent influence; and, indeed, in many bowel disorders among adults (which are often connected with the growth of micro-organisms) alcohol in the form of brandy or red wine (Port or Burgundy) is of great assistance in the treatment. When flatulent colic or neuralgic pains occur in the abdomen, cloths wet with hot whisky externally and some hot toddy internally give prompt relief; in infants, gin and hot water is the remedy most often used for colic.

Dr. Glaser has recently studied the effect of alcohol upon the kidneys and urine. He finds that a moderate quantity of alcohol causes irritation of the kidneys and alters the solubility of the urinary salts, favoring the deposit of oxalate of lime and uric acid. The influence does not extend beyond thirty-six hours, but the continued use of alcohol produces a cumulative effect. Dr. David Cerna, who has also investigated the action of alcohol, concludes that in large doses it enhances coagulation of the blood, while in toxic quantities it destroys the ozonizing power of that fluid and causes a separation of hæmoglobin from the corpuscles.

Upon the nervous system, alcohol first has an exciting effect, followed by narcotism or coma. The arterioles are dilated, thus admitting more blood to the brain, and this is succeeded by diminution of mental activity, owing to the effects of the alcohol upon the ganglion-cells, weakening their action. A similar effect is seen on the spinal cord, usually occurring later than, but sometimes preceding, the brain symptoms. The reflex action of the cord is reduced and the power of co-ordination impaired, so that walking is by a staggering gait, and finally the knees will no longer support the body. This paralyzing effect is also seen in the sympathetic system, since the dilatation of certain vascular areas must be due to the loss of function of the vaso-motor nerves. The action upon the centres in the medulla is seen in the lowered temperature, the slowing of the pulse after a preliminary acceleration, and the sighing respiration or stertor. Death is produced by respiratory paralysis and lowering of the bodily heat. From this it is seen that alcohol will not keep out cold, but will actually hasten the occurrence of death from cold. The experience of Arctic voyagers is to the effect that those persons endure the rigors of the winter best who abstain from alcohol. Dr. Parkes, in the Ashantee campaign, also found that the fatigue of marching in the tropics is borne better without the aid of a spirit ration, owing to the diminution of muscular and nervous energy and capacity for work, due to the physiological action of this agent. The only advantage derived from its use was to take away the feelings of fatigue after the men had come into camp, and thus enable them to eat. It is also useful, in the form of hot drink, to revive a person who has been exposed to cold after the exposure has ceased.

As to the changes that alcohol undergoes in the body, Anstie states that a variable amount (ʒi–iv) disappears, or is burnt up in the blood or the tissues; this quantity may be increased by habit. The excess is thrown off by the lungs, kidneys, bowels, and possibly by the skin.

**Toxicology.**—The symptoms of acute poisoning by alcohol differ so much from those of the chronic form of alcoholism that each state must be separately considered :—

1. Acute poisoning by alcohol manifests itself by an exaggeration of the physiological action. The rapidity with which grave symptoms appear is in proportion to the quantity of alcohol taken, its form, and, to some extent, its temperature, as hot drinks more rapidly intoxicate than cold. Where a large quantity is taken at once, as when a whole bottle of whisky is drunk on a wager, or a comparatively large quantity administered to a child, the stage of excitement is too brief to be noticed, and the patient falls at once into a stupor, which may be followed by coma or fatal convulsions. Where the administration is spread out over a longer period, drunkenness comes on progressively, but ends in unconsciousness and insensibility, and the patient is said to be dead-drunk, because of his complete helplessness. Since alcohol increases the blood-supply of the brain (and especially since drunken men are apt to fall heavily and strike their heads), the state of alcoholic coma may often be accompanied by meningeal hæmorrhage or apoplexy. Intoxicated persons should never be allowed to sleep off their drunkenness, but should be treated as if they were poisoned, as in fact they are. The treatment consists simply in evacuating the stomach with emetics (mustard, etc.), or the pump, and administering ammonia, either the aromatic spirit or the carbonate, both by the mouth and by inhalation. The spirit of Mindererus likewise fulfills the same purpose. Digitalis may be given hypodermically; or, if the patient is noisy, morphine and atropine in moderate doses. It is said that an ounce or two of cider-vinegar has a sobering effect; and after emptying the stomach with the stomach-pump it is well to introduce a pint of warm coffee,—it should not be *hot* coffee, for fear of injuring the stomach during unconsciousness. Artificial respiration and electricity may be required to keep up the breathing and prevent the undue accumulation of carbonic acid in the blood. Cold affusions should be used with care, on account of the lowering of temperature by the alcohol; but heat and sinapisms are of great utility. Apoplexy, or cerebral hæmorrhage, may be suspected when there is marked deviation of the eyes or unequal dilatation of the pupils, especially if there is co-existing paralysis of one side of the face, or of the arm or leg. In such a case the question of surgical interference would come up, to decide upon the presence of fracture of the skull, or meningeal hæmorrhage.

2. Chronic poisoning by alcohol may be shown by the changes taking place in the stomach, liver, and kidneys, increase of fibrous or areolar tissue, followed by contraction and destruction of the characteristic secreting cells, and fatty infiltration, or, in other words, the type of cirrhosis due to the long-continued action of alcohol upon the tissues. Gastric catarrh, indigestion due to deficient action of the liver, and albuminuria from contracted and crippled kidneys are commonly met with in

old alcoholic subjects. Chronic catarrhal pneumonia and fibroid phthisis are also attributable to alcohol. The effects, however, are most marked upon the nervous system. Dr. Wilks has reported cases of paraplegia and numbness. Anæsthesia and violent shooting pains have followed the long-continued and excessive use of alcohol. A case of vaso-motor disturbance due to the habitual use of alcohol has been recorded by Dr. G. Kaempfer. A man who had been an excessive drinker was attacked, half an hour after taking any alcoholic fluid, by patches of erythema of variable size and color, injection of the pharynx and distention of the vessels of the retina. The flush upon the skin faded within an hour after its appearance. One form of insanity is accompanied by pachymeningitis, which may be caused by alcohol.

The damage produced by the habitual consumption of alcohol is not confined to the drunkard, but is transmitted to his children. It has been abundantly shown that the offspring of alcoholics are afflicted with morbid craving for drink and that they are subject to epilepsy, idiocy, chorea, hysteria and physical defects. But when alcoholic poisoning is mentioned we generally understand it to mean delirium tremens or mania a potu. These are not identical; the latter is, to all intents and purposes, an attack of acute mania caused or incited by alcoholic excess. Delirium tremens, on the contrary, is a milder form of delirium, due partly to the action of the alcohol upon the brain, but also very largely to anæmia of the great centres. In the former the patient is violent, and requires several men to control him; but once controlled, and the proper medicines given (potassium bromide, hyoscyamine [gr. $\frac{1}{8}$–$\frac{1}{2}$], or chloroform inhalations), the patient, after a period of sleep, rapidly recovers. In delirium tremens the symptoms are mainly those of anæmia of the brain : it is apt to occur after a bout of drinking lasting several days, during which very little food is eaten, or is rejected by vomiting from the excess of alcohol. Here the patient has a quiet delirium, and has hallucinations of sight and hearing, which in many cases interest him, but his visions may be horrifying and distressing. These patients are best treated with digitalis, and amyl nitrite may be cautiously given by inhalation, or nitro-glycerin by the mouth. Nourishment must be given in a form readily assimilated and at short intervals, hot broths, well seasoned, being the most acceptable to the stomach. If, as is usually the case, the patient has been a steady drinker for a long time, alcohol must not be entirely withheld from him, but given in combination with food. In such subjects the blood-vessels are generally the subject of atheromatous changes, and the heart requires some stimulation in order to carry on the circulation. If the patient cannot sleep, he may be helped by sodium bromide and chloral (āā gr. x), by somnal (ʒss–j), by hop-tea, or the ammoniated tincture of valerian. For the debility and tremor, nux vomica has proven very useful in comparatively large doses of the tincture (fʒss or more). After death from chronic alcoholism the organism shows changes in every part, which Bartholow sums up in two words,—" fibrosis and steatosis."

By inhaling the vapor of alcohol complete anæsthesia may be produced, and the different degrees of intoxication up to insensibility. In such cases the stomach need not be emptied, but artificial respiration in the open air, or the inhalation of oxygen will soon restore the patient to consciousness. This may be hastened by a stimulating enema.

Absinthism, a form of alcoholic poisoning attended by epilepsy, following indulgence in absinthe, has been already discussed.

**Therapy.**—Alcohol may be used as an evaporating lotion in cases of local inflammation, or of bruise or sprain. Diluted alcohol (f℥iij) with lead-water (f℥j) and morphine acetate (gr. x), applied upon a single layer of cloth or absorbent cotton and allowed to evaporate, forms an excellent lotion to keep down inflammation, and in point of cleanliness is much better than the old lead-water and laudanum. Absolute alcohol is used as an astringent application to exuberant granulations (polypi) in the ear, and also applied as just directed to control acute inflammation of cellular tissue, and in erysipelas. Alcohol is a good application to prevent bed-sores, and for this purpose it is customary to add a little alum (ʒj to Oj). Hot applications of alcohol relieve pain, and in facial neuralgia, cold in the face, or toothache, the employment of a small flannel bag containing hops and dipped in hot whisky will generally afford marked relief. In some skin diseases, as ulcers, loss of hair, frost-bite, excessive secretion of sweat or oil, fetid sweating, freckles, and vegetable parasitic affections, concentrated alcoholic preparations may be used. Some useful formulæ are here added :—

℞ Spt. vini rectificat.,
Sol. boro-glyceridi (50 per cent.), . . . . . . āā f℥ij.
M. Sig. : Apply freely in excessive or fetid sweating, and in vegetable parasitic diseases of the skin.

When glycerin does not agree, we may prescribe :—

℞ Spt. vini rectificat., . . . . . . . . . . . . f℥ij.
Cocainæ hydrochloratis, . . . . . . . . . . gr. v.
Acidi borici, . . . . . . . . . . . . ʒj.
M. Sig. : Use with old muslin or cotton in frost-bite, oily secretion, freckles and other pigmentary deposits.

℞ Spt. vini gallici, . . . . . . . . . . . f℥iv.
Tinct. nucis vomicæ,
Tinct. capsici, . . . . . . . . . . . āā f℥ss.
M. Sig. : Employ it on the scalp for loss of hair.

Leloir recommends the local application of alcohol or an alcoholic solution as an effective abortive measure in herpes. The same treatment will relieve the pain of herpes zoster.

Its antiseptic virtues and the astringency which it possesses in consequence of its power of coagulating albumen renders alcohol an excellent gargle in pharyngitis, stomatitis, scurvy, and salivation. It is also useful to apply an alcoholic lotion to the nipples of nursing women, in order to prevent the formation of fissures. Alcohol possesses considerable value as a hæmostatic, and may be utilized in cases where capillary oozing occurs, the following prescription being very valuable :—

℞ Spt. vini rectificat.,
Lin. saponis,
Ext. hamamelidis, fl., . . . . . . . . . āā f℥j.
M. Sig.: Employ as a styptic in local hæmorrhage.

To the action upon the digestive organs, and the stimulating effect upon the nervous system and the circulation of alcohol judiciously given, are to be ascribed its usefulness in the treatment of disease. It is not used in the sick to reduce temperature, although it accomplishes this in health; nor is it given as a narcotic, although its sedative action may not be undesired. In almost all cases it is intended to act as a restorative, and, therefore, its administration must be kept well within physiological limits. In some cases, especially in typhoid fever, unfortunate results have followed its use with too free a hand. In most cases of fever, from f℥ii–iv of whisky daily is amply sufficient, and more than this does harm. It is judicious, however, to make allowance for the patient's habits. One accustomed to the daily use of alcoholic beverages will require proportionally larger doses than an abstainer when attacked by any severe disease.

In phthisis, a tolerance seems to exist and patients can take relatively large quantities without showing any symptoms of intoxication. The late Professor Flint reported the case of a young lady who took a pint of whisky daily for nearly two years for pulmonary phthisis, and was finally cured. In the course of a disease, when the powers of life are succumbing, the first sound of the heart is weak, the pulse feeble, soft, and irregular, but generally rapid; when syncope or delirium threatens, alcohol should be given, endeavoring to combine it with food, such as broth, milk, gruel, etc. The period at which these symptoms generally appear is, in typhus fever, about the end of the first week; in typhoid, at the end of the second week; in small-pox, when the secondary fever commences. The excellent practical rules formulated by Dr. Armstrong for the use of alcohol in fever may be confidently followed. Alcohol is beneficial when the dry tongue moistens under its use, the rapid pulse becomes more slow, the skin less parched, and the respiration more tranquil. If opposite results follow, the remedy should be suspended. To the above rules, Ringer adds that alcohol does good when it produces sleep and quells delirium. In measles, when the eruption turns dark or hæmorrhagic, alcohol is best given in as large doses as will be borne, and at short intervals, as pointed out by Dr. Keating. In acute inflammations, as in pneumonia, when the heart begins to fail and symptoms of debility appear, alcohol can usually be given with marked benefit. In hypostatic congestion of the lungs, typhoid pneumonia, or the pneumonia of the aged, alcoholic stimulation is particularly indicated. Diphtheria, phlegmonous erysipelas, tuberculosis of bones, joints, or glands are affections in which stimulation is demanded. The stronger alcoholic beverages, such as wine, whisky, or brandy, are valuable in old age, when digestion is weak and insomnia marked. Hot spirits and water, cautiously administered, is useful as a restorative in the condition of shock the result of injury. During convalescence from fevers, when the structures of the heart and stomach have been altered by the fever process and digestion is weak, it is often found that malt liquor in some form increases appetite and digestion, improves nutrition, and enables the patient to sleep better at night. In the same way, persons who follow sedentary occupations, and whose bodies are insufficiently nourished, often find much benefit from the use of alcohol in moderate quantities, given just before or taken with their meals.

**Forms of Alcohol.**—In order to estimate the effects of different forms of alcoholic liquors, the following comparative strength should be remembered :—

| | | | | | |
|---|---|---|---|---|---|
| Brandy, whisky, rum, gin, cordials, . | 30 to 50 | per cent. | of | absolute | alcohol. |
| Spanish and Italian sweet wines, . | 13 to 17 | " | " | " | " |
| Hock and claret, . . . . . . | 8 to 11 | " | " | " | " |
| Ale or porter, . . . . . . | 4 to 6 | " | " | " | " |
| Stout or beer, . . . . . . | 4 to 5 | " | " | " | " |
| Koumyss . . . . . . | 1 to 3 | " | " | " | " |

Champagne contains from 8 to 10 per cent., but the presence of the carbonic-acid gas makes it more "heady;" that is to say, the cerebral stimulation is produced more quickly, and with a smaller quantity of alcohol than by the still wines, and the after-effects in the way of headache, or cerebral congestion are less apt to occur. Moreover, the carbonic acid acts as a sedative to the stomach, thus making champagne especially serviceable where the stomach is irritable, and where prompt stimulation is required, as in sea-sickness, or in yellow fever. Where the expense is an insuperable objection, a good substitute may be made extemporaneously by the addition of carbonic-acid water to wine or brandy. Owing to the unreliability of French wines and the practical impossibility of obtaining pure imported brandy, it is our duty to use domestic wines when they have been demonstrated to be sound and pure. The wines of the California Vintage Company fulfill these indications perfectly, and their brandy has received the indorsement of Dr. Foster, the editor of the *New York Medical Journal*, and many other prominent physicians. When we cannot use these wines or brandy, it is safer to prescribe whisky of some standard make.

**Special Applications.**—As an antidote in snake-bite, alcohol enjoys an extensive reputation, which is not without good foundation. The liquor should be given according to effect, a wineglassful or so at a time, repeated at intervals. A ligature should be thrown around the limb or member bitten, if possible, and the part cut out or cauterized; if a finger, it might be safer to amputate it. The ligature should be loosened gradually, and immediately tightened upon the re-appearance of the symptoms. In this way the system will be able to throw off the poison; whereas, if the whole quantity were to be introduced at once, it would be overwhelmed. The alcohol here acts as a stimulant to keep up the circulation until the poison is eliminated.

In septic poisoning, septicæmia, sapræmia, dissecting wounds, etc., alcohol is considered to have an antidotal effect, and, with quinine, constitutes the great reliance for overcoming the tendency to a fatal result, and keeping up the strength. Alcohol is in some measure antidotal to the poison of the bacillus tuberculosis, and it is to this action that its unquestionable value in prolonging life in phthisis is due.

Alcohol should not be given in cases of liver disease, nor in nephritis. In gout, the sweet wines and malt liquors are inadmissible, but if a stimulant is required, whisky may be used cautiously, on account of the tendency to kidney disease. Malt liquors and sweet wines are injurious in diabetes, but dry wine, whisky and brandy sometimes answer a useful purpose in that disease promoting nutrition without increasing the loss of sugar. During the course of a gonorrhœa or urethritis, it is customary to forbid the use of alcohol in any form. It should not be used in hypertrophy, with overaction of the heart.

**ALETRIS.—Star Grass, Blazing Star, Mealy Starwort, Colic Root.**

**Pharmacology and Therapy.**—Aletris farinosa (Hæmodoraceæ) is an indigenous plant, the leaves of which spread upon the ground in the form of a star. The rhizome contains starch and a bitter principle, but appears to be free from tannin. The virtues of the root are extracted by alcohol. In small doses aletris is a bitter tonic, increases the appetite, loosens the bowels and promotes the secretion of urine. In large amounts it acts as a cathartic and emetic. Aletris has been used in colic, chronic rheumatism, and dropsy. It is said to be serviceable, likewise, in dysmenorrhœa. The dose of the powder is 10 grains. An infusion (℥j–Oj) is given in tablespoonful doses. The National Formulary contains a process for preparing a fluid extract.

**ALLIUM** (U. S. P.).—**Garlic.**

### *Preparation.*

*Syrupus Allii* (U. S. P.).—The Syrup of Garlic contains garlic, acetic acid, and sugar. *Dose*, ♏x–ʒj.

**Pharmacology.**—Garlic is the dried bulb of the Allium sativum (Liliaceæ), a native of Asia and Egypt, but now naturalized in Europe and America, and resembles the onion and leek in its chemical characters, as its active principle is a volatile, oily substance—allyl sulphide. Garlic is more active than the others, owing to possessing a larger proportion of the active principle. Only sound, fresh, pungent bulbs should be used.

According to F. W. Semmler, the oil of allium sativum is of a yellow color and an intense characteristic odor, decomposes at 302° F. and does not contain allyl sulphide.

**Physiological Action and Therapy.**—Garlic is antiseptic, but its effects are chiefly those of a stimulating expectorant. While its antiseptic properties have been tried in phthisis without successful results, it is useful as an expectorant in chronic bronchitis, or in suffocative catarrh (capillary bronchitis of infants). Here it may also be made one of the ingredients of poultices to be applied to the chest, or the oil may be used externally, but the offensive odor of garlic will in most families be a bar to its use. A garlic poultice may also be successfully employed in infantile convulsions, and relieves the pain of gastro-enteritis. The syrup is a good addition to cough mixtures, but cannot be used in conjunction with alkalies, such as ammonium carbonate or the bromides, on account of containing free acetic acid. The syrup of garlic can be administered thus with service in the treatment of bronchitis, especially of children:—

℞ Syrup. allii, . . . . . . . . . . f℥ij.
Spts. æther. nitrosi, . . . . . . . . . f℥j.
Glycerini . . . . . . . . . . . f℥j.
M. Sig.: From one to two teaspoonfuls in water every hour or two.

℞ Syrup. allii, . . . . . . . . . . . . f℥iij.
Syrup. picis liquidæ, . . . . . . . . . f℥ij.
M. Sig.: A teaspoonful or two in water every two or three hours.

The juice of garlic in the dose of 2 to 5 drops, has been given for the relief of nervous vomiting.

Garlic, like the onion, has antiscorbutic effects, and is a stimulant carminative. Dose, gr. xxx; best given as a syrup. It is destructive to lumbricoid or round worms. It is also efficient against ascarides when administered by the rectum. Garlic is a domestic remedy in whooping-cough, and a garlic poultice applied to the perineum is said to relieve strangury.

**Allyl Tribromide.**—This compound, otherwise known as tribromhydrin, closely related to the oil of garlic, is a colorless or faintly yellowish fluid, which has a specific gravity of 2.43, solidifies at 50° F., and boils at 422° F. Allyl tribromide dissolves in ether, and in 5-drop doses, enclosed in capsules, has been given with advantage in various spasmodic affections, as hysteria, asthma, whooping-cough, infantile convulsions, and angina pectoris.

## ALLIUM CEPA.—Onion.

### *Preparation.*

*Syrupus Allii Cepæ.*—The Syrup of Onion. *Dose*, fʒi–iv.

**Pharmacology and Therapy.**—The onion (Liliaceæ) is cultivated everywhere, and the bulb is commonly used as a food. Although not official, onions are largely used in domestic practice, as a cataplasm for "earache," or for acute bronchitis; also added to sugar and water and given as a cough-syrup. Parkes ("Practical Hygiene") states that "on account of its volatile oils the onion tribe is largely used, and is a capital condiment, and has an effect as an antiscorbutic." It contains some citrate of lime in addition to the allyl sulphide.

According to the careful studies of Dr. Pilacki, the consumption of onions causes a decrease of the assimilation and metabolism of nitrogenous material. The assimilation exceeds the loss of nitrogen. The urine is generally increased. The diminished assimilation may be due to the injurious effect of large quantities of onion upon the gastric juice and digestion. Dr. Popoff has shown that onions neutralize the acid of the gastric juice. In a small quantity, however, onions promote digestion. Onions, and especially garlic, produce a decided augmentation of secretion of bile. In Siberia great dependence is placed on the onion as a prophylactic against scurvy. Dr. Pogorelsky attributes ecbolic virtue to this plant, and believes that it depends upon the presence of allyl sulphide.*

Dr. Whitla points out that, owing to the large proportion of sulphur which it contains, the Spanish onion may be satisfactorily employed in those cases in which it is desirable to administer sulphur. The action of the volatile constituents enhances that of the sulphur. Boiled Spanish onion, eaten freely at bed-time, is an excellent laxative. The author mentioned values the onion particularly in chronic catarrh of the larger respiratory tubes. According to George Covert, sweet milk removes the odor of onion from the breath. The author can commend the appended prescription for chronic bronchitis in children. The same is also of benefit sometimes in chronic eczema :—

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* *Provincial Medical Journal*, September 1, 1894.

℞ Syrup. allii cepæ (from Spanish onion), . . . . . f℥iv.
Syrup. phosphat. co., . . . . . . . . . . f℥j.
M. Sig.: One or two teaspoonfuls in water or milk three or four times a day.

The raw, sliced onion can be used as a counter-irritant; its volatile constituents are especially irritating to the conjunctiva.

## ALNUS.—Alder-Bark.

**Dose**, gr. x–xl, in decoction, infusion, or fluid extract.

**Pharmacology and Therapy.**—The bark of the American alder or tag alder, Alnus serrulata (Betulaceæ), contains tannic acid, a resin, and an oil. It is used for its astringent effects, chiefly in the form of fluid extract or infusion (ʒj to Oj), as a mouth-wash for spongy gums, a gargle for sore throat, an injection in leucorrhœa, and for applications to ulcers. Internally, it has been given in diarrhœa and hæmaturia. It is reported to have alterative effects, and has been used successfully in scrofula, syphilis, and some cutaneous diseases.

**Alnuin**, an alcoholic extract, composed principally of the resin, has been employed internally in doses of gr. i–iij.

## ALOE (U. S. P.).—Aloes.

### *Preparations.*

*Aloe Barbadensis.*—Barbadoes aloes. *Dose*, gr. ij–x.
*Aloe Purificata* (U. S. P.).—A strained alcoholic extract. *Dose*, gr. i–xx.
*Aloe Socotrina.*—Socotrine aloes. *Dose*, gr. v–xx.
*Extractum Aloës* (U. S. P.).—Extract of aloes. *Dose*, gr. ss–v.
*Pilulæ Aloës* (U. S. P.).—Pills of Aloes.
*Pilulæ Aloës et Asafœtidæ* (U. S. P.).—Pills of Aloes and Asafetida.
*Pilulæ Aloës et Ferri* (U. S. P.).—Pills of Aloes and Iron.
*Pilulæ Aloës et Mastiches* (U. S. P.).—Pills of Aloes and Mastic.
*Pilulæ Aloës et Myrrhæ* (U. S. P.).—Pills of Aloes and Myrrh.
*Pilulæ Rhei Compositæ* (U. S. P.).—Compound Pills of Rhubarb.
*Tinctura Aloës* (U. S. P.).—10 per cent. *Dose*, fʒss–ij.
*Tinctura Aloës et Myrrhæ* (U. S. P.).—Of each, 10 per cent. *Dose*, ʒss–ij.
*Aloinum* (U. S. P.).—Aloïn. *Dose*, gr. $\frac{1}{10}$–ij.
*Pulvis Aloës et Canellæ.**—Aloes, 80 parts; Canella Alba, 20 parts. *Dose*, gr. xx.
*Extractum Aloës Liquidum* (50 per cent.). *Dose*, ♏v–xl.

*Decoctum Aloës Compositum* (*Baume de vie*) contains about 4 grains aloes to the ounce, with cardamom and liquorice-extract and myrrh. *Dose*, f℥ss–ij.

Aloes also enters into compound extract of colocynth (50 per cent.) and compound tincture of benzoin (2 per cent.).

**Pharmacology.**—Aloes is the inspissated juice of the leaves of Aloe vera and other species (Liliaceæ). Owing to the fact that aloes frequently contains foreign matters, the pharmacopœia directs that for making preparations only purified aloes should be used, obtained by dissolving aloes in alcohol, passing the solution through a strainer, and allowing the alcohol to evaporate. This occurs in dark masses of a yellowish-brown color, the fracture presenting a liver-like appearance (hepatic aloes). It has a very bitter taste, is soluble in alcohol, less soluble in water, unless boiling, and contains **Aloin**, or socaloin, a volatile oil and a resin. Barbadoes aloes and Cape aloes each contains a variety of aloin, and the former is official in the last revision of the United States Pharmacopœia.

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* Commonly known by the name of hiera picra, or "hickory pickory" by the vulgar.

Aloin is a yellowish-white crystalline substance, soluble in hot water and alcohol, sparingly soluble in ether, chloroform and benzol. It is of neutral reaction, destitute of odor, and its taste, which is sweetish at first, subsequently becomes very bitter.

**Physiological Action.**—The principal effect of aloes is that of a slowly-acting purgative, principally affecting the large intestine. It increases the peristaltic movements without producing excess of secretion; so that the fæces are formed and only slightly softened. It is a true cholagogue, increasing the secretion of biliary salts, and renders the bile more watery when given in large doses. As it sometimes gripes, it is best to combine some carminative with it. It may cause irritation of the bladder, diminution of urine, and albuminuria from renal congestion. It also has emmenagogue properties. Following large doses, the uterus and appendages are more or less in a state of congestion and hæmorrhoids are apt to be irritated. If there has been an overdose and these symptoms are aggravated, it would be sufficient to give large draughts of demulcents, and an anodyne in the form of an opium suppository. It is stated that such phenomena do not follow the administration of aloin, which requires only about one-third or one-half the dose in order to produce the physiological effects of aloes.

The chemical and physiological investigations of Professor Meyer seem to indicate that aloin itself is not an active purgative, but that it becomes gradually decomposed in the intestine into a more energetic substance. It is thought that this may account for the slowness of its action.

Powdered aloes, dusted upon an abraded or blistered surface, may be absorbed and exert a purgative effect. Aloin has been detected in the urine.

**Therapy.**—Aloes, or aloin, is a slowly-acting purgative, and, therefore, should generally be administered at bed-time; in this way it operates during sleep, and griping is avoided. For the same purpose it is well to combine it with a carminative, as in the compound decoction, or the compound rhubarb-pill, which is a useful purgative for an ordinary attack of constipation. The following are likewise excellent formulæ to use in the same class of cases :—

℞ Vini aloës,
Ext. cascaræ sagradæ fl., . . . . . . . āā fʒ vj.
Elix. aromatic., . . . . . . . . q. s. ad f℥ vj.
M. Sig.: A tablespoonful morning and evening.

℞ Pil. aloës et myrrhæ, . . . . . . . . . . ʒiij.
Pulv. glycyrrhizæ comp., . . . . . . . . ℥iv.
M. Sig.: From one-half to three teaspoonfuls in water or milk, early in the morning or on retiring.

Kohlstock has experimented in the clinic of Professor Senator, of Berlin, with aloin and other cathartics applied locally to the rectum. The aloin was dissolved in a small quantity of glycerin and subsequently in formamide, 1 gramme (15 grains) of the former to 10 grammes of the latter. A dose of 6 to 8 grains was found efficient in all mild cases of constipation.

The pill form is also useful for the expulsion of ascarides, which are apt to lodge in the cæcum; with this may be combined injections of aloes in solution (ʒj to Oj) and irrigation of the bowel. For the latter purpose, in young children, a soft catheter can be inserted beyond the sigmoid flexure of the colon. In anæmia affecting young girls (chlorosis), Sir Andrew Clarke has shown that constipation has much to do with its causation; he calls it fæcal intoxication. Here aloes, in combination with iron, is of much service.

℞ Aloës purificatæ, . . . . . . . . . . ʒ ij.
Massæ ferri carbonatis, . . . . . . . . . gr. xl.
Pulv. aromatici, . . . . . . . . . gr. xx.
M. et ft. pil. no. xx.
Sig.: Take one or two at bed-hour.

Sir Andrew Clarke's pill is likewise valuable:—

℞ Aloin.
Ferri sulph. exsic.,
Ext. bellad.,
Ext. nucis vom.,
Pulv. ipecac.,
Pulv. Myrrh,
Saponis, . . . . . . . . . . āā gr. ss.
M. et. ft. pil. no. j.
Sig.: One pill one hour before last meal, should the bowels not act during the day.

Ipecac is omitted if there is any cardiac weakness.

In cases of hysteria, with anæmia and constipation, the pills of aloes, with asafetida, may be given (3 to 6 daily). These have also a carminative effect. An atonic condition of the muscular coat of the large intestine may allow its contents to accumulate, to press upon the common bile-duct and obstruct the passage of the biliary secreton into the upper bowel. This condition and the jaundice which is its result are relieved by the administration of aloes, with which belladonna and strychnine, or hyoscyamus and ipecacuanha, may be very usefully combined in such formulæ as the following:—

℞ Aloës purificatæ, . . . . . . . . . . ʒ ss.
Extr. belladonnæ folior. alc., . . . . . . . gr. j.
Strychninæ sulphatis, . . . . . . . . . gr. ss.
M. et ft. pil. no. xij.
Sig.: A pill three times a day.

℞ Aloini, . . . . . . . . . . . . gr. j.
Ext. hyoscyami, . . . . . . . . . gr. x.
Ext. ignatiæ, . . . . . . . . . . gr. j.
Pulv. ipecacuanhæ, . . . . . . . . . gr. ij.
M. et ft. pil. no. x.
Sig.: A pill three times a day.

Aloes is an excellent emmenagogue; given for several days before the expected period, it is generally successful, especially when employed thus:—

| | |
|---|---|
| ℞ Aloini, | gr. ij. |
| Mass. ferri carb., | gr. xxxvj. |
| Apiol., | ♏lx. |

M. et ft. capsulæ no. xij.

Sig.: A capsule morning and evening for five or six days before the menstrual period.

In scanty menstruation, depending upon anæmia, the chalybeates should also be pushed, preferably using the preparations of iron which are not constipating, such as the dialyzed iron, or the carbonate or pyrophosphate, rather than the sulphate which is contained in the official pill. When intestinal indigestion is caused by deficient secretion of bile, aloes is of special value, and enjoys a reputation as an ingredient in "dinner-pills" of many kinds. Where the mental symptoms of dyspepsia, drowsiness, depression of spirits, or melancholia, are marked, the use of a good dinner-pill immediately after dinner is often effective.

In cases where there are hæmorrhoids, the aloes sometimes irritates them; under such circumstances the proper course to pursue would not be to neglect such a valuable remedy, but to operate surgically upon the piles and remove them. The passive turgescence of the inferior hæmorrhoidal vessels, however, is not infrequently relieved by the use of aloes. Whitla speaks of having obtained surprising results in obstinate diarrhœa in children or adults from the administration of a few 1- to 2-ounce doses of the compound decoction of aloes. Prescribe the following :—

| | |
|---|---|
| ℞ Aloini, | gr. ij. |
| Sulphuris subl., | gr. c. |
| Ext. belladonnæ folior. alc., | gr ij. |

M. et ft. capsulæ no. xx.

Sig.: A capsule three times a day.

In small doses aloes acts as a hepatic and intestinal tonic, and, where diarrhœa is maintained by the action of germs of fermentation, the increased flow of bile exerts an antiseptic effect and the diarrhœa may be checked after a preliminary purge; although the rule is that, where diarrhœa is due to irritation from abnormal condition of the contents, the cause of disturbance should be removed by a more prompt cathartic, such as sulphate of magnesia or the citrate, or by an antiseptic purgative like calomel or blue mass. Aloetic purgatives should be used with care during pregnancy and lactation. The milk of women taking aloes will purge babes whom they suckle. Aloes may be used as a derivative in cerebral disorders.

A glycerole of aloes is prepared by evaporating the tincture and adding glycerin. This mixture may be applied to fissures, abrasions, and ulcers. The bitter taste of aloes is sometimes utilized by applying a solution to the finger-ends of children in order to break them of the habit of biting their nails or sucking their thumbs, or to the nipple when it is desired to wean an infant, which is unnecessary cruelty. The compound tincture of benzoin contains 2 per cent. of aloes. This fact should be borne in mind when treating cracked nipples with this preparation, as the infant may be weaned too early.

## ALTHÆA (U. S. P.).—Marshmallow.

*Preparations.*

*Syrupus Althææ* (U. S. P.).—Syrup of Althea (5 per cent.).
*Confectio Althææ.*—Marshmallow Drops.

**Pharmacology.**—The root of Althæa officinalis (Malvaceæ) contains a mucilaginous principle, with about 2 per cent. of asparagin, but no tannin. Althæa is a constituent in massa hydrargyri (blue mass) and phosphorus pills.

**Therapy.**—The powdered root may be used as a poultice. It is slightly diuretic, on account of the asparagin, which would make it of service in children's diseases in the form of a fresh infusion, especially in Bright's disease. The confections are useful in sore throat, in scarlatina and diphtheria. The syrup is an agreeable addition to cough mixtures. Dose, indefinite. Althæa combined with benzoinated lard is a bland dressing for skin diseases. Asparagin has been recommended as a diuretic in gout and cardiac dropsy, in doses of gr. i–ij.

## ALUMEN (U. S. P.).—Alum.

*Preparations.*

*Alumen Exsiccatum* (U. S. P.).—Dried Alum. *Dose*, gr. i–v.
*Alumini Hydras* (U. S. P.).—Aluminum hydrate. *Dose*, gr. iii-xx.
*Alumini Sulphas* (U. S. P.).—Aluminum sulphate. For external use.
*Alumen Ammonio-ferricum.*—Iron Alum. *Dose*, gr. ii–x.
*Alumenis Glyceritum.*—Glycerite of Alum (20 per cent. alum).
*Alumini Oleatum.*—Oleate of Aluminum. (See the Oleates.)

**Pharmacology.**—The official alum is potassium alum (aluminum and potassium sulphate). It is in the form of translucent, white, octahedral crystals, with a sweetish, astringent taste and acid reaction. It contains water of crystallization, which can be driven off by heat, forming dried alum. Ammonia alum, which was formerly the official alum, has very much the same properties, and is often dispensed for alum. The metal aluminum is not official. In appearance it is like silver, but is much lighter and more durable; is useful for making instruments, in place of silver.

**Physiological Action.**—Dried alum is astringent, and is a mild escharotic for fungous granulations. The glycerite of alum is useful in cases of tonsillitis or pharyngitis of subacute character. In solution, alum condenses tissues by coagulating their albumin, and acts as an astringent.

**Therapy.**—It checks excessive sweating in phthisis when applied with a sponge (ʒj to Oj of whisky and water). It is used as an injection in leucorrhœa and in gonorrhœa, and a watery solution of the glycerite is useful as a collyrium in conjunctivitis. In the latter affection **alum-curd** is sometimes applied ($\frac{1}{2}$ drachm beaten up with the albumin of a fresh egg).

In chronic granular conjunctivitis Dr. W. T. Montgomery, of Chicago, makes use of:—

℞ Cupri sulphat.,
Zinci sulphat.,
Ferri sulphat.,
Alumin. sulphat., . . . . . . . . . . āā gr. v.
Aq. destill., . . . . . . . . . . . f℥j.
M. Sig.: Brush upon the inside of the lids once daily.

Applied locally in the form of powder or saturated solution, alum is an excellent styptic. A most useful alum styptic combination is the following:—

℞ Aluminis glyceriti,
Spt. vini rectificati,
Lin. saponis, . . . . . . . . . āā f℥ij.—M.

Compresses soaked in the prescription just referred to, or a solution of alum, may be used to restrain capillary hæmorrhage from wounds, bleeding from the gums, or leech-bites. In epistaxis a plug of cotton moistened in alum-water may be passed into the nares; a solution may be thrown in by injection or powdered alum may be snuffed. These measures will frequently prove successful. In chronic pharyngitis, tonsillitis, and nasal catarrh the local action of powdered alum is beneficial. A prescription composed thus is often effectual:—

℞ Acidi carbolici, . . . . . . . . . . ♏iij.
Aluminis glyceriti, . . . . . . . . . f℥iij.
Aristol, . . . . . . . . . . . . . ʒss.
M. Sig.: Apply with cotton or a camel's-hair brush once or twice a day over the surface.

It may also be used in solution as a gargle with good effect. The local application of a solution of alum is of benefit in cases of mercurial ptyalism. Mr. Corson asserts that gargling the throat with one or two drachms of alum dissolved in 6 or 7 ounces of a decoction of barley with the addition of 2 drachms of honey of roses is a serviceable practice in the case of speakers and singers shortly before using the voice.

An injection of alum is a serviceable astringent in hæmorrhage from the rectum, or in gonorrhœa. For gleet, the following formula is recommended:—

℞ Pulv. aluminis, . . . . . . . . . . ʒij.
Ext. geranii maculati, . . . . . . . . f℥ss.
Aquæ rosæ, . . . . . . . . . . . f℥ivss.—M.

In the vulvitis of children a solution of a drachm of alum to a pint of water is a serviceable local application and may from time to time be used as an injection. A solution of 10 grains to the pint is a useful application in chronic cystitis and relieves vesical pain and frequency of micturition while decreasing the production of ropy mucus.

A lotion containing alum may be successfully employed in the prolapsed bowel of children. A drachm or two of alum to the pint of water, or alcohol, is a beneficial application in hyperidrosis. It is said that 10 grains of alum, placed dry upon the tongue, will sometimes arrest a paroxysm of asthma (Ringer). According to Ringer, many cases of chronic ozæna are rapidly relieved by irrigating the nasal chambers with a solution containing a drachm of alum to the pint of water. The discharge is checked and the fœtor removed. Pruritus of the vulva sometimes yields to an alum solution. The local astringent action of this substance is sometimes found beneficial in purpura. An ointment containing alum is often useful in herpes, and the same preparation removes the offensive odor of bromidrosis. The following formulæ are of service in the diseases just named:—

| | |
|---|---|
| ℞ Pulv. aluminis, | ʒj. |
| Salol, | ʒss. |
| Bismuth. subnit., | ʒj. |
| Ungt. zinci oxidi, | ℥j.—M. |

| | |
|---|---|
| ℞ Pulv. aluminis, | ℥ss. |
| Glycerini, | f℥j. |
| Aquæ hamamelidis, | f℥v.—M. |

In chilblains, also, a solution of alum has been used with asserted advantage.

As an emetic in croup, a heaping teaspoonful of alum may be dissolved in four ounces of simple syrup, of which a teaspoonful is given every fifteen minutes until vomiting is produced. It is useful in bronchorrhœa and in whooping-cough, especially where the secretion is excessive. Given internally, alum checks hæmorrhage and profuse discharges. Whitla esteems it the best remedy in hæmorrhage of the bowel due to typhoid fever. It may be given with good result in the hæmatemesis dependent upon cirrhosis of the liver and in hæmoptysis. The local action of alum may be aided by its internal administration in the night-sweats of phthisis. It checks excessive production of mucus in chronic gastric and intestinal catarrh, and it relieves the pain of gastralgia and enteralgia. It is an efficient remedy in diarrhœa.

Clysters containing alum have been successfully employed in chronic dysentery, and even in the acute form of the disease have sometimes been found of service. The drug may likewise be given internally in the management of dysentery.

Whitla considers the internal exhibition of alum of service in leucorrhœa. The following formulæ are advised:—

| | |
|---|---|
| ℞ Pulv. aluminis, | ʒiij. |
| Acidi sulph. arom., | fʒj. |
| Ext. geranii maculati fl., | f℥ij. |
| Syrup. zingiberis, | f℥iij. |

M. Sig.: One to two teaspoonfuls in water every half hour or hour until hæmorrhage is arrested. For hæmoptysis, hæmaturia, menorrhagia, and uterine hæmorrhage.

| | |
|---|---|
| ℞ Pulv. aluminis, | |
| Salol, | āā gr. c. |

M. et ft. capsulæ no. xx.

Sig.: A capsule three or four times a day. Employ especially in catarrh of the bladder and prostatitis.

| | |
|---|---|
| ℞ Pulv. aluminis, | gr. cc. |
| Tinct. kino, | f℥iss. |
| Tinct. opii camph., | f℥j. |
| Acidi sulph. arom., | fʒj. |
| Spt. vini gallici, | q. s. ad f℥v. |

M. One to two teaspoonfuls in water every three or four hours. Serviceable in chronic diarrhœa, dysentery, and in hæmaturia.

Some cases have been reported in which this remedy was thought to be useful in diabetes mellitus, though it would probably prove of more decided utility in diabetes insipidus.

In comparatively large doses (gr. xl–ʒj), alum acts as a purgative, and has been used in colica pictonum. In this condition it relieves the pain and overcomes the constipation. Dr. Phillips speaks of its being useful in other forms of gastralgia and colic. It has proved of benefit in intermittent fever in 5-grain doses, although its action is not uniform in this affection. Iron alum has been employed in intermittent hæmaturia. For boils in the ear, a solution of aluminum acetate (25 per cent.) may be dropped into the ear frequently, and the canal plugged with cotton. Alum is sometimes used as an adulterant of baking-powder, and, when constantly used, produces indigestion.

The aluminum salts are antiseptic and can be used as injections for leucorrhœa (gr. x-℥j), and saturated solutions are mild caustics. The oleate of aluminum arrests morbid discharges.

*Aluminum acetico-tartaricum.*—This compound occurs in the form of almost colorless pieces, having an odor resembling that of vinegar, a slightly acid and not disagreeable taste. It is soluble in water, but not in alcohol. It is chiefly used as a mouth-wash and gargle. A 50-per-cent. solution is recommended in the treatment of frost-bite. This substance has been applied also as a dressing to wounds. It is non-toxic, astringent and antiseptic.

*Boral and Cutol.*—Aluminum boro-tartrate under the name of boral and aluminum boro-tannate under the title of cutol have been brought forward as antiseptic and astringent preparations, suitable for use in dermatology. Boral is soluble and cutol is insoluble in water. The latter may be rendered soluble by the addition of tartaric acid, in which form it is claimed to be useful as an injection in gonorrhœa. Cutol has been employed with alleged success in facial erysipelas.

*Aluminum boroformiate.*—This compound is made by heating together boric acid, formic acid and alumina. It occurs as large crystalline scales, soluble in water, contains 33.5 per cent. of alumina, and has been used as a substitute for other preparations of aluminum. A solution of boroformiate, saturated with ammonia and evaporating the clear fluid, constitutes aluminum ammonio-boroformiate.

*Sozal.*—Under this name an organic salt of aluminum has been introduced for use as an antiseptic application. Sozal is obtained by dissolving aluminum hydrate in phenol-sulphonic acid. It is a crystalline substance, readily soluble in water, glycerin and alcohol. Sozal has an astringent taste and a faint odor of carbolic acid. A 1-per-cent. solution was found beneficial as an injection in abscess, tuberculous ulcers, etc.

## ALUMNOL.

**Pharmacology.**—This is the name given to a substance discovered by Filehne, of Breslau. It consists of a mixture of aluminum salts of naphthol-sulphonic acid, and contains 5 per cent. of aluminum and 15 per cent. of sulphur. Alumnol occurs in the form of a fine white or light pink-colored powder, free from odor, not hydroscopic, readily soluble in water, soluble in glycerin, less so in alcohol, and insoluble in ether. Its solution in alcohol exhibits a beautiful blue fluorescence. The solutions possess an acid reaction. The taste of alumnol is sweetish and astringent. Alumnol precipitates albumin and gelatin, but is redissolved in excess of those substances. It possesses marked penetrative action. It strikes a blue color with solutions of ferric chloride. Alumnol darkens upon exposure to the air, without losing its properties.

**Physiological Action.**—This substance is antiseptic, astringent, and, in concentrated form, cauterant.

Alumnol exerts no toxic influence except when employed in very large quantities and under very favorable conditions for absorption. In practice, no aluminum was found in the urine of patients who had been treated by large doses and for a considerable period.

**Therapy.**—It may be used as a lotion, ointment, or plaster. Alumnol is a serviceable application to ulcers, wounds, and abscesses. For the irrigation of abscess-cavities it may be used in a 10 to 20 per cent. solution. A 1-per-cent. solution is beneficial as an injection in gonorrhœa, and in endometritis due to gonorrhœa sticks containing from 2 to 5 per cent. may be employed with advantage.

A 4-per-cent. solution dropped into the eye arrests the flow of tears for several minutes,—a property which will, in certain instances, materially facilitate examination.

Dr. Stipanics of Buda-Pesth, has used alumnol with advantage in the treatment of chronic rhinitis, hypertrophic rhinitis, simple ozæna, acute and chronic pharyngitis, tonsillitis, etc. This writer regards the remedy as of special efficacy in affections of the larynx. Hoarseness due to laryngeal catarrh was speedily removed by inhalations of ½ to 1 per cent. aqueous solutions. According to this writer's experience the mucous membrane of the nose is particularly sensitive to alumnol. Dr. Stipanics, moreover, indicates the styptic property of this remedy as of avail in arresting hæmorrhage. He has demonstrated that 1-per-cent. nasal douches would frequently check bleeding after the application of a tampon had produced only a temporary effect. Dr. Wolffberg recommends a 4-per-cent. solution for the purpose of cleansing the eyes in gonorrhœal ophthalmia. By Dr. Brieger alumnol has been used with success in the treatment of purulent inflammation of the middle ear.

M. Chotzen has reported his experience with this remedy in more than three hundred cases. He describes it as a beneficial application to chancres and chancroids, balanitis, and erosions. Solutions containing from 1 to 5 per cent. are of value in moist and papular eczema, acne, and furunculosis. An alcoholic solution of 2.5 to 10 per cent. is effective in urticaria, sycosis, and psoriasis. Incorporated with lanolin, in the strength of 2.5, 5, 10, and 20 per cent., it is successful in eczema, seborrhœa capitis, psoriasis, and favus. In erysipelas and lupus alumnol is also employed with good results. In these affections Dr. Chotzen applied the remedy according to the following formula:—

| | |
|---|---|
| ℞ Alumnol, . . . . . . . . . . | ʒj. |
| Lanolin. anhydr., . . . . . . . . | ʒv. |
| Paraffin liquid, . . . . . . . . . | ʒiijss. |
| Ceresin,* . . . . . . . . . . | ʒss. |

M. ft. ungt.

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* Ceresin is a natural mineral product which closely resembles white wax. It consists of a mixture of solid paraffin with some oxygenated bodies, and is found in Galicia and Southern Utah.

As an injection in gonorrhœa he used :—

| | |
|---|---|
| ℞ Alumnol, | ʒ ss–j. |
| Aq. dest., | f ʒ ss–j. |
| Glycerin, | f ʒ iij. |
| Ung. lanolin, | ℥ ij. |

M. Sig. : To be injected by means of an ointment syringe.

Varnishes have also been prepared by incorporating alumnol with salep- and tragacanth-bassorin, castor-oil and collodion, Canada balsam and collodion, caoutchouc, etc. These varnishes are useful in treating various forms of eczema, psoriasis, lupus, epididymitis, etc.

**ALVELOZ** is the milky juice of Euphorbia heterodoxa, belonging to the Euphorbiaceæ, a native of Brazil.

The irritating effects of the juice of plants of this genus is very marked in alveloz, which is said to act as a caustic upon the skin very much like zinc chloride. It has been used in treating cancerous and syphilitic lesions with asserted success, and the application is comparatively painless.

**AMBRAGRISEA.—Ambergris** is an odorous, fatty substance, found in large masses floating upon the water, and is believed to be produced in the intestines of the spermaceti whale. It has a consistence like wax, softening at the temperature of the hand, and melting below the boiling-point of water; it is almost entirely volatilized by heat, and is inflammable. In composition it is like cholesterin, and is not saponifiable. It is believed to have some antispasmodic effects, and is official in the French Codex as a 10-per-cent. tincture. The dose of ambergris is gr. v–ʒj. It is used very largely in perfumery on account of its agreeable odor.

**AMMONIACUM** (U. S. P.).—**Gum Ammoniac.**

*Preparations.*

*Emulsum Ammoniaci* (U. S. P.).—Emulsion of Ammoniac, 4 per cent. *Dose* f ʒ i–iv.

*Emplastrum Ammoniaci.*—Ammoniac Plaster, made with the aid of acetic acid.

*Emplastrum Ammoniaci cum Hydrargyro* (U. S. P.).—Ammoniac and Mercury Plaster (ammoniac, 72 ; mercury, 18 ; with oleate of mercury, diluted acetic acid and lead plaster).

*Pilulæ Ammoniaci.*—Ammoniac Pills (ammoniac, gr. ij.; ginger gr, ij ; squill, gr. ss ; with soap, q. s.).

**Pharmacology.**—Ammoniac is a gum-resin obtained from Dorema ammoniacum (Umbelliferæ), containing a volatile oil. It occurs in the form of tears, of variable size, hard and brittle, having a faint, unpleasant odor and a bitter-sweet, somewhat acrid, taste. It forms a milky emulsion when rubbed up with water.

**Therapy.**—It is a stimulating expectorant and laxative, and resembles asafœtida in its effects upon the system. It has been used, with alkalies, to relieve chronic bronchitis and asthma. It is especially beneficial in chronic bronchitis associated with emphysema, or occurring in aged persons. The algid stage of cholera has been treated in the Fiume Hospital by gum ammoniac internally, conjoined with stimulants and the hypodermic injection of ether. Warm baths were also administered. The plasters are useful in glandular and joint swellings. By fusing ammoniac and other resins with caustic potassa resorcin is obtained, which is a valuable antiseptic. An alcoholic extract of ammoniac is fused with three times its weight of potassa, and dissolving the resulting homogeneous mass in water, slightly acidulating with sulphuric acid, following and agitating with ether. On evaporating the ether, impure resorcin is left, which is purified by recrystallization. (See Resorcin.)

**AMMONIUM.**—Metallic ammonium has not yet been isolated. It is known only in its combinations, which are numerous and important. According to Ampère, its constitution is $NH_4$, therefore not a simple but a compound radical, and as such it forms salts which are analogous to potassium salts.

*Preparations (liquid).*

*Aqua Ammoniæ* (U. S. P.).—Contains 10 per cent. gaseous ammonia. *Dose*, ♏ii–x.

*Aqua Ammoniæ Fortior* (U. S. P.).—Twenty-eight per cent. ammonia. External use.

*Linimentum Ammoniæ* contains ammonia water 35, alcohol 5, cotton seed-oil 60 parts.

*Spiritus Ammoniæ* (U. S. P.).—Spirit of ammonia, or Hartshorn (10 per cent.). *Dose*, ♏v–xv.

*Spiritus Ammoniæ Aromaticus* (U. S. P.).—Aromatic Spirit of Ammonia. *Dose*, fʒss–ij.

*Liquor Ammonii Anisatus.*—Ammoniated Solution of Anise. Same use as preceding.

*Liquor Ammonii Acetatis* (U. S. P.).—Solution of Ammonium Acetate. Spirit of Mindererus. *Dose*, fʒi–iv.

*Tinctura Guaiaci Ammoniata* (U. S. P.). *Dose*, ♏xxx–lx.

*Tinctura Valerianæ Ammoniata* (U. S. P.). *Dose*, fʒss–j.

*Preparations (solid).*

*Ammonii Benzoas* (U. S. P.).—Ammonium Benzoate. *Dose*, gr. ii–x.

*Ammonii Bromidum* U. S. P.).—Ammonium Bromide. *Dose*, gr. x–xv.

*Ammonii Carbonas* (U. S. P.).—Ammonium Carbonate. *Dose*, gr. ii–v or xx.

*Ammonii Chloridum* (U. S. P.).—Ammonium Chloride. *Dose*, gr. v–xx.

*Ammonii Iodidum* (U. S. P.).—Ammonium Iodide. *Dose*, gr. v–x.

*Ammonii Nitras* (U. S. P.).—Ammonium Nitrate. *Dose*, gr. x–xxx.

*Ammonii Sulphas* —Ammonium Sulphate.

*Ammonii Phosphas.*—Ammonium Phosphate. *Dose*, gr. iiss–xx.

*Ammonii Valerianas* (U. S. P.).—Ammonium Valerianate. *Dose*, gr. ii–v.

*Trochisci Ammonii Chloridi* (U. S. P.).—Troches Ammonium Chloride.

*Glycyrrhizinum Ammoniatum* (U. S. P.).—Ammoniated Glycyrrhizin. *Dose*, gr. ss-v.

*Hydrargyrum Ammoniatum* (U. S. P.).—Used only externally.

*Ammonium Boras.*—Ammonium Borate. *Dose*, gr. iv.

**Pharmacology and Physiological Action.**—Ammonia is a gaseous body, highly irritating to the air-passages, even suffocating, and may cause inflammation with œdema of the glottis. It stimulates the trifacial nerve, increases the blood-tension by reflex action upon the vaso-motor centre, and prevents syncope. If applied to the skin it is rubefacient, and, if diffusion be prevented, it will soften and vesicate the skin. The strong solution also produces vesication and softens the cuticle. Ammonium chloride, on the other hand, is cooling and absorbent.

The chloride, after absorption, hastens epithelial proliferation of the bronchial mucous membrane and liquefies thickened mucous secretions. The carbonate is probably decomposed in the digestive track, and its effects are identical with those of the gas or of aqua ammonia, in stimulating the heart and circulation.

Ammonia acts upon the ganglionic nervous system especially, and has little effect upon the higher centres, thus differing from alcohol. It increases the functional activity of the spinal cord and is a promptly acting cardiac stimulant. Its accelerator nerves and the heart itself are stimulated by medicinal doses of ammonia. Blood-pressure is moderately increased, but in large doses ammonia interferes with the oxygen-carrying power of the red blood-corpuscles, and if long continued produces emaciation. Ammonia likewise stimulates the respiratory centre. Again, the protracted use of ammonia, by neutralizing the gastric juice, enfeebles digestion, and in this manner also leads to emaciation. It may originate a gastro-intestinal catarrh. Injected into the blood-vessels, the blood-corpuscles become dissolved and the blood remains fluid. Ammonia likewise assists in maintaining the solution of the fibrin of the blood. Such injections are likely to be followed by vomiting, and the carbonate may be given for the same purpose by the mouth, in doses of 20 to 30 grains. Ammonia increases the secretions not only of the bronchial mucous membranes, but also the intestinal, and may set up diarrhœa. The solution of ammonium acetate acts upon the skin, especially in fever. Ammonia has no special action upon the kidneys, except that the urea is increased by oxidation of ammonia according to the observation of Dr. Bence Jones, who also found that nitric acid made its appearance in the urine after the administration of ammonia or its salts; it is eliminated especially by the kidneys, broncho-pulmonary tract, and skin. Ammonia possesses marked antiseptic virtues.

**Poisoning.**—As the ammonia water or spirit of "hartshorn," is found in every household, cases of poisoning by accidental swallowing not rarely occur. When the stronger solutions are swallowed there is great distress, burning pain along the œsophagus and in the stomach, with choking sensations from inhaling the gas or the admission of a few drops into the larynx. After death there are evidences of softening and acute inflammation of the stomach.

**Treatment.**—Vomiting is likely to occur immediately, but if not, the administration of large quantities of bland liquid, such as oil or milk, would be serviceable, and if the solution of the gas has been taken it may be neutralized with vinegar or lemon-juice. Treatment should be promptly instituted in order to avoid such a degree of inflammation as would produce stricture of the œsophagus. If the patient is in a state of shock, hot infusion of coffee may be administered, and tincture of digitalis given hypodermically.

**Therapy.**—The local uses of ammonia have been already intimated. In sprains, bruises, and old rheumatic swellings, the liniment is of service, especially if some oil of turpentine or chloroform be added.

The water of ammonia may very serviceably enter into the composition of a stimulating application in alopecia. In the headache which attends disordered menstruation or the menopause, Dr. Tilt has seen Raspail's sedative lotion afford much relief. This preparation contains 2 ounces of liquor ammoniæ, 2 ounces of common salt, 2½ drachms of spirits of camphor, and 2 pints of water. The liquid may be applied upon a sponge or linen cloth. Weak solutions of ammonia will sometimes relieve the itching of urticaria. For this purpose 2 drachms of the official solution of ammonia may be added to a pint of water, or ammonia carbonate may be employed in the strength of 1 drachm to 4 ounces of water. The following combinations of ammonia are also of service for external use:—

| | |
|---|---|
| ℞ Aquæ ammoniæ, | |
| Ext. arnicæ fl., | |
| Lin. saponis, | |
| Olei terebinthinæ, | āā f℥ij. |

M. Sig.: Rub in well several times a day. For rheumatism, bruises and sprains.

| | |
|---|---|
| ℞ Lin. ammoniæ, | f℥ij. |
| Spt. chloroformi, | f℥j. |
| Lin. menthol,* | f℥ij. |
| Tict. opii, | f℥j. |

M. Sig.: Apply well over the surface when necessary for lumbago, neuralgia, and sciatica.

| | |
|---|---|
| ℞ Spt. ammon. aromat., | |
| Tinct. capsici, | āā f℥ss. |
| Spt. lavandulæ, | f℥j. |
| Tinct. nucis vomicæ, | f℥ss. |
| Lin. camphoræ, | f℥iiss. |

M. Sig.: Apply with friction to the scalp for loss of hair and for dandruff.

Spirit of ammonia is a good application to wounds caused by stings of insects or snake-bites. In the latter case, the ammonia water can also be injected into a vein in order to counteract the depressing effects of the venom. In poisoning by sewer-gas, intra-venous injection of ammonia has saved life. Ammonium chloride solution (ʒii-iv-Oj) removes ecchymosis from contusions. This solution is applicable likewise to epididymitis after the acute stage has subsided. It is, in fact, an excellent dressing in the latter stage of superficial inflammation, and promotes the absorption of exudation. Dr. J. H. Freeman, of Nevada City, Cal., warmly recommends ammonium chloride in the treatment of rhus toxicodendron poisoning. He dissolves 2 drachms of the salt in 4 ounces of water, and directs it to be applied to the affected parts two or three times a day. The swelling and the burning pain rapidly disappear.

In neuralgia, thimble-blistering may be practised over the painful spots of Valleix, by dropping some stronger aqua ammoniæ upon absorbent cotton and confining it with a watch-glass or thimble in contact with the skin.

Ammonia is invaluable as a cardiac and nervous stimulant in pneumonia and all typhoid conditions, in poisoning by prussic acid, in syncope, and in heat exhaustion. The carbonate is the most eligible form, given in doses of gr. v–x. In capillary bronchitis in infants, the following answers a good purpose:—

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* Linimentum menthol as suggested by Martindale (see The Extra Pharmacopœia, London) is composed of menthol, 3 parts; chloroform, 4 parts; and olive-oil q. s. to make 16 parts.

| | |
|---|---|
| ℞ Ammonii carbonatis, | gr. xii–xxiv. |
| Syrup. tolutani, | fʒiv. |
| Liq. ammonii acetatis, | f℥iiss. |

M. Sig.: Give a teaspoonful every hour or every two hours.

According to Dr. Beverley Robinson, ammonium carbonate, in rather large and frequently-repeated doses, is very efficient in aborting a cold. The following formula is often most efficient as an expectorant, especially in the late stage of bronchitis:—

| | |
|---|---|
| ℞ Ammonii carb., | ʒj. |
| Syr. senegæ, | fʒiv. |
| Vini ipecac., | fʒiij. |
| Syr. tolutani, | f℥j. |
| Spt. chloroformi, | fʒiij. |
| Aq. camphoræ, | q. s. ad f℥iv. |

M. Sig.: One to two teaspoonfuls every hour or two until relieved.

In the broncho-pneumonia of children, Marfan orders:—

| | |
|---|---|
| ℞ Ammon. acetat., | |
| Sodii benzoat., | āā gr. xxiv. |
| Sp. vini gall., | fʒj–ijss. |
| Syr. tolutani, | |
| Julep. acaciæ, | āā f℥ij |

M. Sig.: Dessertspoonful every hour or two according to age. The quantity of brandy is also regulated according to age.

The value of ammonium carbonate in scarlet fever has been extolled by Peart, Wilkinson, and Witt. It was employed in 3- to 5-grain doses, hourly, or at longer intervals, according to the severity of the case. It reduces fever and cerebral excitement and promotes sleep. The solution of ammonium acetate is also highly recommended in scarlatina. The plan is to administer the remedy in large doses, which have been found to be well borne, even by children. The carbonate has likewise been employed in measles, in which disease Ringer states that he has used it largely with considerable benefit. The same salt is valued by some practitioners in the treatment of small-pox and erysipelas.

Delirium tremens, being usually associated with cerebral anæmia and weakened cardiac action, may be benefited by the use of ammonium carbonate. Its value in this affection is conspicuous, according to the prominence of the symptoms just mentioned. The solution of ammonium acetate is preferred by Dr. Norman Kerr.

Ammonium carbonate and acetate have been used in diabetes mellitus. Eichhorst states that in two of his cases the use of the carbonate was followed by rapid disappearance of the sugar from the urine; yet the progress of the pulmonary lesions was not interrupted, and speedily proved fatal.

**Special Applications.**—The aromatic spirit of ammonia may be given in typhoid fever, in doses of ʒss–j, in order to sustain the circulation (Da Costa), or in cough mixtures in place of the carbonate. The aromatic spirit of ammonia is a good antacid in hyperacidity of the stomach. It is likewise of service in the sour stomach and tympanites which not infrequently occur in hysterical women. Nervous headache is often relieved by the same preparation. Ammonium chloride may be administered thus as a hepatic stimulant:—

| | |
|---|---|
| ℞ Ammonii chlor., | ʒiij. |
| Sodii chlorid., | ʒj. |
| Succi tarax., | f℥ij. |
| Decocti aloës co., | ad f℥viij. |

M. Sig.: A dessert- to a table-spoonful in water three or four times a day.

The chloride has a special action upon the liver, increasing the flow of bile (Ringer). It is, therefore, useful in torpor of the liver, sick-headache, biliousness, and also in jaundice due to obstruction of the gall-ducts. It has some reputation as an emmenagogue. Ammonium chloride is esteemed of value in catarrh of the stomach and bowels, and Bartholow considers it useful in the first stage of cirrhosis.

M. Marotte esteems this salt as of value in cholera. He administers it in doses proportionate to the severity of the disease and states that it produces a return of warmth and perspiration and also stimulates the kidneys to action. Dr. J. J. Trussewitsch regards ammonia as one of the best cardiac stimulants in cholera. He gives it by hypodermic injection, making use of 3 to 8 drops of the saturated solution diluted with a syringeful of water. The effect is prompt and continues for some time. It may also be given internally in the same disease.

In myalgia and neuralgia this salt is capable of affording relief, and should be given in rapidly-increasing doses until the effect is obtained or the system becomes intolerant of the remedy. It has also been used in intermittent hæmaturia. It is best given in capsules, on account of its nauseating, sea-water taste.

Dr. G. Corrie states that the chloride of ammonium is an excellent remedy in cystitis from various causes. He gives it in doses of 15 to 30 grains and obtains marked and rapid relief.

In bronchitis in its first stage, with deficient secretion, it may be combined as follows:—

| | |
|---|---|
| ℞ Ammonii chloridi, | ʒij. |
| Potassii iodidi, | gr. xvj. |
| Tinct. ipecacuanhæ, | ♏xxxij. |
| Mist. glycyrrhizæ comp., | q. s. ad f℥iv. |

M. Sig.: Dose, a tablespoonful every four hours.

This formula is of special service in acute catarrhal pneumonia. The chloride is particularly valuable in chronic bronchitis accompanied by profuse secretion. It is asserted that the continued use of large doses of this salt may excite ulceration of the stomach.

In catarrhal conditions of the respiratory tract Krakauer recommends the use of ammonium chloride in the form of a spray. Ammonia carbonate may also be used as an emetic in such cases. In the later stages of pneumonia expectoration is promoted by the same remedy. Liquor ammonii acetatis is one of our most reliable diaphoretics, and enters into the composition of many fever mixtures:—

| | |
|---|---|
| ℞ Ext. aconiti fld., | gtt. iij. |
| Spts. chloroformi, | fʒiv. |
| Liq. ammonii acetatis, | f℥iiss. |

M. Sig.: Give a dessertspoonful every two or three hours in fever.

Both the chloride and the solution of the ammonium acetate are effectively given for the purpose of sobering a drunken person.

The bromide has a special influence over whooping-cough, and may be substituted for the potash salt in epilepsy and nervous affections. A double salt, ammonium and rubidium bromide, has recently been introduced as a remedy for epilepsy. The substance is readily soluble in water. Its dose is that of the other bromides. Active doses are from 30 grains upward, and as much as 2 drachms daily, or even more, may be given, dissolved in syrup of lemon and water. Laufenauer has used it in all the epileptic states with the exception of hystero-epilepsy.* In acute rheumatism with nervous symptoms, DaCosta reported good results from the use of ammonium bromide (gr. xx–xl) several times daily.

A very beneficial prescription for insomnia and in gouty subjects is :

| | |
|---|---|
| ℞ Sodii bromidi, | ʒ vss. |
| Tinct. lupulini, | f℥ ij. |
| Spt. chloroformi, | f℥ ij. |
| Aquæ camphoræ, | f℥ ij. |

M. Sig.: Two teaspoonfuls in water every hour or two when necessary.

The valerianate enjoys some reputation for its influence over hysterical manifestations, and may be given in capsules (5 to 20 grains) or as an elixir † (not official) :—

| | | |
|---|---|---|
| ℞ Ammonii valerianatis, | | gr. c. |
| Elixir aurantii rubri, | | f℥ viij. |
| Aquæ ammonii, | q. s. ad | react. neut. |

M. Sig.: Dose, a tablespoonful.

Of the remaining salts little need be said. The phosphate is diuretic and has been used in gout, which may be connected with deficient excretion of urea. The benzoate, where the urine is alkaline, as in cystitis, has advocates, as it is excreted as hippuric acid, and thus prevents phosphatic deposits. The nitrate is only used to prepare nitrous-oxide gas, which it yields by exposure to heat. The sulphate is used in making other salts. The iodide may be employed in syphilitic affections, where the other iodides are too depressing.

In the strength of half a drachm to the ounce of glycerin, ammonium iodide is recommended as an efficient local application to enlarged tonsils, being painted upon the glands once daily with a camel's-hair brush. Ammonium borate, according to Professor Lashkevich, reduces expectoration and, at times, the pyrexia of pulmonary tuberculosis.

Hypodermically, aqua ammoniæ may be administered in shock, in chloroform narcosis, in poisoning by hydrocyanic acid or hydrogen sulphide, and also in heart-clot, thrombosis, and snake-poisoning. Where a prompt effect is needed, the remedy should be injected directly into a vein (♏x–xx).

### AMYGDALA. Almond.

The United States Pharmacopœia recognizes two varieties of almond (Rosaceæ),—(1) the seed of Prunus amygdalus ; variety, Amara ; and (2) the seed of Prunus amygdalus; variety, Dulcis. Each has its own official preparations.

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* *Medical Bulletin*, July, 1890.

† In the National Formulary the Elixir of Ammonia Valerianate contains vanilla and a little chloroform to cover the odor and taste of the salt, of which there are present 2 grains to each drachm, as in the formula above.

*Preparations.*

*Oleum Amygdalæ Amaræ* (U. S. P.).—Oil of Bitter Almond. *Dose*, ♏¼-j.
*Aqua Amygdalæ Amaræ* (U. S. P.).—Bitter-Almond Water. *Dose*, f℥ss.
*Syrupus Amygdalæ* (U. S. P.).—Syrup of Almond, "Orgeat" Syrup. *Dose*, fʒii-f℥ss.
*Emulsum Amygdalæ* (U. S. P.).—Emulsion of Almond. *Dose*, fʒii-f℥ss.
*Oleum Amygdalæ Expressum* (U. S. P.).—Expressed Oil of Almond. *Dose*, fʒii-f℥ss.
*Unguentum Aquæ Rosæ* (U. S. P.).—Ointment of Rose-Water, "Cold Cream."

**Pharmacology.**—Both varieties of almond contain fixed oil and emulsin, but only the bitter variety has also amygdalin. Hydrocyanic acid is formed when amygdalin and emulsin react upon each other, and it is to the presence of the acid thus formed that the sedative and antispasmodic effects of oil of bitter almond are due. Its toxic effects are also identical, and call for the same treatment as hydrocyanic acid.

**Therapy.**—In prescribing, the volatile oil of bitter almond must not be confounded with the fixed oil obtained from either variety by expression, the latter being a bland application, especially in the form of ung. aquæ rosæ, to irritable skin or chapped hands or lips. In doses of 1 or 2 drachms it is laxative, and may be used as a substitute for olive-oil. The oil of bitter almond has been employed in emulsion as a local application in pruritus, and internally for the same purposes as hydrocyanic-acid solution. The mixture is a soothing application to inflamed skin, and it may be combined according to these formulæ:—

| | |
|---|---|
| ℞ Emuls. amygdalæ, | f℥j. |
| Bismuth. subnit., | ʒj. |
| Aristol, | ʒj. |

M. Sig.: For local application to freckles and skin pigmentations.

| | |
|---|---|
| ℞ Emuls. amygdalæ, | f℥j. |
| Hydrarg. chlor. corros., | gr. iij. |
| Ammon. chloridi, | gr. iv. |

M. Sig.: Valuable in skin pigmentations.

| | |
|---|---|
| ℞ Hydrarg. chlor. corros., | gr. j-ij. |
| Emuls. amygdalæ, | f℥iv. |

M. Sig.: For external use in acne rosacea.

Under the name of resorbin Lebermann has introduced a mixture which is said to be very readily absorbed by the skin. It is made by emulsifying purest almond-oil with distilled water, a small quantity of yellow wax, gelatin and soap, and is brought to an exact consistence by the addition of a little lanolin. It is recommended as an excellent vehicle for active drugs in medication of the skin, and may be used in ichthyosis, pityriasis, scleroderma, sclerema neonatorum, seborrhœic eczema, prurigo and scabies. Resorbin will, it is claimed, promote the absorption of mercury by the skin.

Bitter-almond water is a good vehicle in which to administer narcotic drugs. The syrup of almond may be appropriately added to cough mixtures. The emulsion of almond is an agreeable demulcent, and may very well be employed as a vehicle of more active remedies.

Flour prepared from blanched sweet almonds is used in making bread, cakes and puddings for diabetic patients.

An eruption similar to that of urticaria has been reported as a result of the ingestion of bitter almonds.

**AMYL NITRIS** (U. S. P.).—**Amyl Nitrite.**

**Dose**, ♏¼–j, internally; by inhalation, ♏ iii–v.

**Pharmacology.**—A clear, pale-yellowish liquid, of an ethereal, fruity odor, an aromatic taste, and a neutral or slightly-acid reaction. It is insoluble in water, but soluble in alcohol, ether, and choloroform, in all proportions. It volatilizes at ordinary temperatures, and should be kept in a glass-stoppered bottle, or in small glass pearls, each containing 3 or 5 minims. Vessels or tubes containing this fluid must be handled with care, as it readily explodes at ordinary temperatures. It results from the reaction of nitric acid upon amylic alcohol, and may be contaminated with nitric or hydrocyanic acid.

**Physiological Action.**—No local effects are ascribed to this remedy, but when taken internally, by the digestive tract, or by inhalation of its odor, very remarkable phenomena are produced. There is at once observed a flushing of the face, with fullness and throbbing of the temporal vessels; the patient complaining of headache, fullness, and oppression, with giddiness and confusion of ideas. The reflex excitability of the cord is diminished. The brain is indirectly influenced, and its functions exalted by the temporary congestion. The action of the heart becomes excessively rapid, with weakening of the pulse and marked lowering of arterial tension, owing to the general enlargement of the vessels, due to action of the drug upon the muscular coats of the arteries, and not to the nervous system or vaso-motor centres. Immoderate doses occasion failure of cardiac action, arrest taking place in diastole. According to the investigations of Professor Leech, of Manchester, the nitrites affect especially the blood and muscles. They depress the nerve centres and nerves but their action in this respect is less marked. Amyl nitrite diminishes oxidation, and the arterial and venous blood both become of the same dark color. Respiration and temperature are both reduced. Sugar appears in the urine after inhalation, probably as the result of increased circulation in the liver. It increases the flow of urine, possibly, in the same way, or because the liver-sugar may act as a diuretic. In poisoning from amyl nitrite the blood assumes a characteristic chocolate color, due to the formation of methæmoglobin.

In some patients the nitrites excite gastric irritation and diarrhœa. Professor Leech regards these compounds as useful, unirritating diuretics. Amyl nitrite is both absorbed and eliminated with great rapidity.

**Therapy.**—The application of the knowledge of physiological action to therapeutics has probably never been more direct and logical than the recommendation of Brunton to treat the paroxysms of angina pectoris with amyl nitrite, in which clinical experience has shown the truthfulness of the hypothesis. Whether the relief be due to lowering of arterial tension, as Brunton asserts, or to the alleviation of the neuralgic condition, as claimed by Johnson, is not very material, since by inhalation of a few drops of this remedy the patient has complete control over the attacks. Dyspnœa due to other forms of cardiac disease and to pulmonary lesions is also relieved by administration of this remedy. It is particularly adapted to symptoms dependent upon disease of the mitral valve, but aortic incompetence, according to Professor Leech, offers no objection to its use in small quantities when the breathing is oppressed. In asthma, where the spasmodic element is strong, amyl nitrite promptly affords amelioration.

Ultzmann recommended as an injection in chronic cystitis where the secretion is catarrhal and has a bad odor:—

| | |
|---|---|
| ℞ Amyl nitrit., | ♏v. |
| Aq. destillat., | f℥iv. |

M. Sig.: Tablespoonful in water sufficient for a vesical injection.

Amyl nitrite can often be resorted to with benefit for sea-sickness, especially in this formula, given by Martindale:—

| | |
|---|---|
| ℞ Amyl nitritis, | ♏xvj. |
| Spirit. rectificat., | fʒij. |
| Misce et adde | |
| Pulv. tragacanthæ, | gr. vj. |
| Aquæ destillatæ, | q. s. ad f℥iv. |

The powdered gum tragacanth should be in a dry four-ounce bottle, into which the amyl solution is poured, and the water added gradually afterward. Shake well. Dose, one or two drachms.

In epilepsy, tetanus, neuralgia, chloroform narcosis, and in strychnine poisoning, amyl has been tried with gratifying results; in whooping-cough it has failed. Benefit results from its inhalation in neuralgic dysmenorrhœa, and it is recommended by Dr. Winterburn for the relief of after-pains. His practice is to saturate a small piece of tissue paper with 5 or 6 drops of the nitrite and place it in a tightly corked two-drachm vial, from which the patient can inhale when the pain is severe. Professor Benedikt recommends a mixture of 5 parts of amyl nitrite with 10 parts of volatile oil of fennel for the relief of angeiospastic hemicrania. Five drops are to be poured upon a handkerchief and cautiously inhaled. Amyl nitrite is beneficial in migraine dependent upon local vaso-motor spasm.

In anæmic epileptics, the inhalation before a fit sometimes prevents it. The remedy should not be given to plethoric epileptics, nor to elderly people with brittle arteries. It is particularly adapted to those cases of epilepsy in which an appreciable interval occurs between the aura and convulsion. Dr. S. Weir Mitchell states that amyl nitrite may be advantageously employed as a means of diagnosis between undoubted *petit mal* and attacks simulating that disorder, but caused by temporary congestion of nerve centres. In the latter class of cases amyl nitrite intensifies the paroxysm. Sir Crichton Brown has found this agent specially serviceable in the status epilepticus.

Inhalation of amyl nitrite is serviceable in stimulating the heart in the event of sudden failure, which may occur in fatty heart or after hæmorrhage. It has proved beneficial in intermittent coryza. In intermittent fever it will avert or suppress the chill, but is without influence on the hot stage.

*Nitro-glycerin*, *trinitro-glycerin*, or *glonoin* has the same physiological effects as amyl nitrite, but is usually administered in solution (alcoholic, 1–100). The dose of the freshly-made centesimal solution is $\frac{1}{2}$ to 2 or 3 drops, which is preferable to the tablets of the British Pharmacopœia, each containing gr. $\frac{1}{100}$. The action is slower but more permanent than that of amyl. Murrell praises this remedy highly, not only for typical angina, but for breathlessness and attacks of pseudo-angina. Da Costa has given it in the form of Bright's disease attended by high arterial tension (cirrhotic kidney), in the following combination*:—

| | |
|---|---|
| ℞ Nitroglycerini, | gr. $\frac{1}{100}$. |
| Tr. digitalis, | ♏ij. |
| Tr. strophanthi, | ♏ij. |
| Tr. belladonnæ, | ♏ss. |

M. et ft. tabella.
Sig.: Take one every six hours until effect upon the pulse is obtained.

In the treatment of angina pectoris and severe asthma, Hoffman† recommends subcutaneous injections of nitro-glycerin in dose of $\frac{1}{120}$ to $\frac{1}{60}$ grain. He claims remarkable results from these injections, without any objectionable after-effects.

Dr. Elliot Bates has, in a number of instances, seen very marked relief from the hypodermic injection of nitro-glycerin in those cases of epilepsy where the patient falls with rigid limbs. He administered it in the dose of $\frac{1}{100}$ grain. Good results have been observed in hystero-epilepsy from the hypodermic injection of $\frac{1}{100}$ grain of nitro-glycerin, the spasm being controlled within a few minutes.

A few drops of nitro-glycerin placed upon the tongue have been used with success in order to relieve the craving of the opium habituate. Dr. Speer records a case in which nitro-glycerin was successfully employed in morphine poisoning, 6 grains having been taken by a lad aged 17 years. An injection of $\frac{1}{50}$ grain was soon followed by an improvement in the respiration and, in half an hour, by vomiting, after which $\frac{1}{100}$ grain was administered in the same manner. Two hours subsequently the patient was out of danger. Case reports great relief in Raynaud's disease from the injection, thrice daily, of $\frac{1}{100}$ grain of nitro-glycerin gradually increased to $\frac{1}{50}$ grain. In threatened collapse caused by pneumonia, drop doses of the 1-per-cent. solution, as advocated by Dr. Andrew H. Smith, of New York, act as a diffusible stimulant and often avert the danger.

Dr. Trussewitsch recommends the use of nitro-glycerin in the algid state of cholera. One or two drops of the 1-per-cent. solution placed upon the tongue causes dilatation of the peripheral blood-vessels, decreases the blood-pressure and relieves the heart. Dr. Humphries employs nitro-glycerin in various forms of vomiting with very good results. He has also found it valuable in acute or chronic gastric catarrh of the infant or adult, and has used it successfully in the vomiting of pregnancy. Given subcutaneously it acts as a prompt restorative in a case of poisoning from illuminating gas. Dr. D. D. Stewart points out that a tolerance to this remedy is sometimes readily acquired by patients, whose anxiety prompts them to increase the doses. This tendency must be guarded against by temporarily discontinuing the drug from time to time and resuming with a smaller dose than that last used.

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* These can be obtained from H. K. Mulford & Co., Philadelphia, in the form of soluble compressed triturates.

† *Pharmaceutical Journal and Transactions*, June 28, 1890.

A remarkable example of acquired tolerance to nitro-glycerin has been placed upon record by Dr. G. E. Reading, of Woodbury, N. J. The patient, a woman, suffering from chronic interstitial nephritis, was placed at first upon the doses of $\frac{1}{100}$ grain, which was gradually increased until, in less than a year, she was taking an amount equivalent to 6 grains. The symptoms of the disease were by this time apparently cured.

On account of the explosive properties of nitro-glycerin, it would be safer not to accumulate too large a number of the tablets, nor to shake them violently. This objection, says Murrell,* will not apply to the form in which nitro-glycerin is ordinarily dispensed. The 1-per-cent. solution, he adds, is perfectly safe, and may be used without fear; in fact most chemists keep a 5-per-cent. solution. The same authority also gives a series of experiments made by himself in hammering and bringing a red-hot wire in contact with M. Martindale's pills of nitro-glycerin, thus demonstrating their safety. All pills and tablets of nitro-glycerin may not be so safe as those he referred to.

**Antagonists.**—The physiological antagonists to the action of amyl and nitro-glycerin are strychnine, belladonna, sclerotinic acid, and, in general, those remedies which raise arterial tension and diminish blood-supply to the great centres by producing contraction ot blood-vessels. In case of unpleasant or serious symptoms after its use, the exhibition of ammonia by inhalation and by the mouth, the hypodermic injection of atropine or ether, with cold water or ice-bag to the head, mustard poultice to the epigastric region, or to the extremities, keeping the patient warm and in the recumbent posture, will very soon be followed by relief, as the symptoms are usually quite evanescent.

*Amyl valerianate* is an active preparation, which is regarded as a valuable hypnotic and antispasmodic. It is combined, according to Dr. W. F. Wade's formula, by taking 1 part of amyl valerianate to 19 of alcohol, to which is added amyl acetate in the proportion of 1 minim to 2 ounces. (Dose, ♏ vi-viij.) This dissolves cholesterin readily, and is considered better in cases of gall-stone than either chloroform or ether.

Amyl valerianate relieves the pain of hepatic colic and prevents recurrences. It has been found of advantage in muscular rheumatism and in dysmenorrhœa. It is useful likewise in relieving hysterical manifestations. Amyl valerianate is a colorless liquid of pleasant taste.

**AMYLENE HYDRAS.**—Amylene hydrate is tertiary amylic alcohol (dimethylethylcarbinol).

**Dose,** ♏ x-xxx.

**Pharmacology and Physiological Action.**—It is a mobile, colorless liquid, with a camphor-like odor. It boils at 102.5° C. (216.5° F.), and at 200° C. (392° F.) is decomposed into amylene and water. It forms compounds with chlorine, bromine, and with iodine. Oxidation converts it into acetic acid and acetone. Soluble in alcohol in all proportions, and in water 1 to 8.

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* Nitro-glycerin in Angina Pectoris, by W. Murrell, M.D., F.R.C.P., London, 1882.

Harmack and Meyer state that amylene hydrate at first excites but afterward successively paralyzes all the nerve centres. It likewise depresses the temperature. According to the experiments of Peiser, amylene hydrate diminishes the waste of nitrogenous tissue. He therefore regards it as particularly adapted to those cases in which a hypnotic is needed for prolonged use, and in which decided nitrogenous waste occurs.

**Therapy.**—It may be used as an antispasmodic in doses of ♏xv-xxx, given in capsules, in alcoholic solution, or with mucilage. It has been used in insomnia and mania. In mental affections Dr. Hans Evensen esteems amylene hydrate as somewhat uncertain, but finds it particularly useful in cerebral anæmia.

It has been given also in delirium tremens, and in nocturnal epilepsy. Nache coincided with Wildermuth as to the efficacy of amylene hydrate in frequent and severe attacks of epilepsy, especially where the bromides have failed. He thinks the *petit mal* and nocturnal epilepsy are much benefited by the drug. It has also been recommended for whooping-cough and to relieve the cough of phthisis. No dangerous after-effects have been observed from the use of this remedy.

### **AMYLUM** (U. S. P.).—**Starch.**

*Preparations.*

*Amylum Iodatum.*—Iodized Starch (5 per cent.). *Dose,* ʒj.
*Glyceritum Amyli* (U. S. P.).—Glycerite of Starch (10 per cent.). Local use.

**Pharmacology and Therapy.**—Starch is the fecula of the seed of Zea Mays (Gramineæ.) It is an important element of food, and forms a large part of rice, wheat, barley, arrowroot, and other commonly-used carbohydrates for administration to the sick. Starchy foods should not be given to young infants, who have not sufficient saliva or intestinal juices to digest them, for they may undergo putrefactive changes in the bowel and cause colic and diarrhœa. Starch is a fine, white powder, becoming adhesive when moist, and is a good application for burns or scalds, and for intertrigo, or chafing in infants. With boiling water, the starch-granules swell and burst and a homogeneous mass results, which answers very well as a poultice for alleviating local inflammation. The glycerite is a useful application in some skin affections, though the glycerin sometimes proves irritant, on account of its affinity for water. Starch is a convenient antidote to most corrosive poisons, when mixed with water; it is a test for free iodine, as it turns blue when brought in contact with this agent. Starch water is a very good basis for laudanum injection or some other form of medicated enema, especially when it is combined as follows:—

| | |
|---|---|
| ℞ Aquæ amyli, . . . . . . . . . . . | f℥j. |
| Bismuthi subnit., . . . . . . . . . . | ʒss. |
| Tinct. opii, . . . . . . . . . . . . . | ♏v vel x. |

M. Sig.: Inject into the bowel when necessary. Use after a stool in diarrhœa.

℞ Aquæ amyli, . . . . . . . . . . f℥ss.
Chloral. hydratis, . . . . . . . . . gr. iij vel v.
M. Sig.: Throw into the bowel every two or three hours in cholera infantum.

## ANACARDIUM—Cashew Nut.

**Pharmacology and Therapy.**—Anacardium occidentale (Terebinthaceæ) is a small tree, indigenous to tropical America, and naturalized in certain parts of Africa. The nut is enclosed within two shells, between which is contained an acrid, oily liquid, which turns black when in contact with the air. The principal constituents of this fluid are anacardic acid, a white, crystalline substance, and cardol, a yellowish or reddish oil.

The juice or oil is an active local irritant and has been employed for the destruction of corns and warts, for the cure of obstinate ulcers and ringworm. It has also been used as a topical agent in the treatment of leprosy. Tubercles and a portion of skin surrounding them are painted with the oil, which is then rubbed into the skin. After a little oozing a scab forms, and when it falls it is seen that the tubercle is diminished in size. The oil should not be applied to a surface of more than six inches square. In young persons and upon parts where the integument is thin the oil gives rise to violent irritation.

## ANIMAL SECRETIONS, EXTRACTS AND JUICES.

**Pharmacology.**—Various secretions, juices, or tissues have been recently made use of in therapeutics. The extract obtained from the testicle by M. Brown Séquard, and employed by him and others for the relief of organic and functional nervous disorders and certain constitutional diseases, is described under the head of spermine hydrochlorate. The virtue of testicular fluid has been shown to depend upon the presence of spermine—a substance which is also contained in other glands, especially the pancreas.

**Physiological Action.**—The injection into the human body of extracts obtained from animal tissues may prove of service by modifying the constitution of the blood, or by supplying to it elements of which it stands in need. It is conceivable that when the functions of certain organs, especially those concerned in nutrition and sanguification, are suppressed, the introduction of the corresponding tissues, secretions, or extracts derived from healthy animals may prove beneficial. Acting upon this theory, preparations representing muscular, nervous, renal, and thyroid substance have been employed in practical therapeutics.

**Therapy.**—A glycerin-extract of gray matter of sheep's brain has been used by M. Constantin Paul with encouraging results in neurasthenia, locomotor ataxia, and senile debility. Dr. Dana has witnessed amendment in the same class of cases from the use of a glycerin brain extract, and instances particularly a case of rapidly advancing bulbar palsy in which marked improvement was effected. Seven months after the beginning of the treatment no trace of the disease remained except slight fatigue after long conversation or mastication. In regard to some of the cases it is specially stated that the injection of water had been ineffectual, a proof that the amendment was not due, as thought by some critics, to mere suggestion. Dr. Julius Althaus, of London, has also given favorable testimony concerning the effect of injections of nervous substance. The brain extract, which he terms cerebrine-alpha in order to distinguish it from the alkaloid cerebrine obtained from brain matter, was prepared by mixing one part by weight of rabbit's brain with 1 part of glycerin and a 0.5-per-cent. carbolic solution. The extract of the cord is made in the same manner and is called myeline-alpha, to avoid confusion with the myeline which is one of the constituents of the central nerve-fibre. Dr. Althaus found that the extracts were of no benefit when swallowed, as they were decomposed by the gastric juice. When injected into the substance of muscle they were active in the average dose of 5 minims. Both agents seemed of equal service in cerebral and spinal diseases. They were beneficial in locomotor ataxia, progressive muscular dystrophy, and in those maladies and conditions mainly characterized by loss of nerve power. In functional nervous disorders good results were obtained from the use of these extracts alone, but in organic affections they seemed to act chiefly as adjuvants to other treatment. They were useful also in promoting convalescence from acute diseases and in relieving the disabilities of old age. From his experience Dr. Althaus also dissents from the idea that the results are simply due to suggestion.

Babès has employed an emulsion made by mixing normal brain and spinal cord with broth in the proportion of 1 part of nerve tissue to 5 of broth. About a drachm of the mixture was injected and proved useful in cases of epilepsy, melancholia, obstinate insomnia, chronic headache, sciatica and other disorders of the nervous system.

Preparations of cardiac tissue have been injected for the relief of asystole. Nephrine, a saline glycerin extract of the cortical substance of the kidney, has been proposed as a remedy in cases of nephritis. Subcutaneous injections of nephrine will, it is thought, prove of service in the treatment of uræmia. M. Dieulafoy has described the results of his experimental use of nephrine in an aggravated case of uræmia. The patient suffered from suppression of urine, œdema of the lung, copious perspiration and diarrhœa, an abundance of urea being contained in the excreted fluids. After injections of nephrine, urine was again secreted, sweating of urea ceased, the mind cleared and the patient was able to speak. The case was too far advanced for any method of treatment to be of avail, but the decided effects produced upon a patient actually *in extremis* undoubtedly warrants a continuation of this interesting therapeutical experiment.

Further clinical experiments have been made by Teissier and Fraenkel. These observers found that the injection of a glycerin-extract of sheep's kidney in patients suffering from nephritis augmented the power to excrete toxic substances in the urine. The subjects experienced a sense of general amelioration. Albumin, at least in some cases, disappeared from the urine during the days when the injections were given. There was little or no influence upon the quantity of urine passed. The serum of the blood of the lamb and the ox has been injected into syphilitic subjects, in a number of cases, by Italian clinicians, and the symptoms of the malady have undergone decided improvement. The quantity employed was about 1½ fluidrachms, thrown, upon alternate occasions, into the subcutaneous tissue of each buttock. No other medication was used in these experimental cases. Cotterell made use of dog's serum in two cases of recent syphilis. The rash and other manifestations quickly disappeared under the influence of the injection. Some observers have thought that improvement followed the injection of dog's serum in pulmonary tuberculosis and neurasthenia. The serum of the dog was experimentally employed by Tommasoli in three cases of lupus. The method, however, proved of doubtful utility. Though the lesions were favorably modified, especially in one case, the disease took on fresh activity at the end of a month. The subject deserves continued investigation. It is possible that the blood of animals insusceptible to syphilis may have an antagonistic action to the virus of that disease.

The most decided results from the use of animal tissues or extracts have been obtained in the treatment of myxœdema.* This disease depends upon abolition of the functions of the thyroid gland. It has been amply demonstrated that grafting of a healthy thyroid upon the body of the patient or the injection of an extract made from the gland is followed by remarkable and rapid amelioration. Thyroid extract is made by cutting the gland into thin slices, bruising and adding about a drachm each of glycerin and sterilized water to each gland. After standing for twenty-four hours the fluid, which is thick and of a dull, red color, is strained.

The quantity of the extract thrown in is 25 minims, and the operation is repeated once or twice a week, according to the severity of the case and the rate of improvement. At the end of a month or six weeks the condition has generally been so signally benefited that the procedure can be practised at longer intervals. The extract is prepared by mincing the gland, freshly taken from a healthy animal, maceration, and filtration under pressure. The preparation and injection should be made with every antiseptic precaution. The numerous cases, in all stages, which have been reported, leave no room for doubt that in this method we have acquired an effective weapon against a disease which had been unamenable to any other mode of treatment.

It has been demonstrated by Dr. Hector Mackenzie, of London, and Dr. E. L. Fox, of Plymouth, that the administration of the thyroid or a glycerin-extract of the gland, by the mouth, is perhaps as efficacious as the injection. The gland may be given raw, finely chopped, seasoned, and added to beef tea, or it may be lightly fried. Thorough cooking would probably destroy its virtue. It is not necessary that a large quantity of the remedy should be taken. Half a gland or, at most, one gland, or an equivalent quantity of the extract, twice a week, is sufficient, and if a proper amount is exceeded vomiting and increased frequency of the pulse are produced. Caution must be enjoined as regards the sudden resumption of physical exercise when improvement takes place. A sudden or excessive strain upon a weakened heart may occasion syncope.

Dr. S. Solis-Cohen has observed that thyroid extract has a very decided diuretic power and has employed it with satisfaction as a diuretic in a patient with no apparent disease of the thyroid gland. He speaks also of a case of acromegaly in which the administration of the same remedy alleviated headache, and suggests that it may be of service in a recent case by preventing or retarding enlargement of the pituitary body.

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* See report of *London Clinical Society*, *Lancet*, February 4, 1893; also the *British Medical Journal*, February 4, 1893.

Byron Bramwell and Arthur T. Davies have reported several cases of stubborn psoriasis and eczema which were cured by thyroid feeding or the use of tablets of thyroid extract. Bramwell was led to make use of this agent on account of its favorable effect upon the skin in myxœdema.

From an investigation of the chemical composition of the thyroid gland, Dr. Frederick Gourlay states that it contains no ferment capable of dissolving mucin, that the only proteid which can be obtained from it is a nucleo-albumin, and is inclined to believe that its usefulness in the treatment of myxœdema is due to the presence of the nucleo-albumin. He asserts, also, that the secretion of the gland does not consist of mucin. The dried and powdered gland has also been employed under the name of thyroidin. The powder is of a grayish-yellow color, and a peculiar odor. It is thought to be better tolerated than the gland. The virtues of an entire gland of medium size are said to be represented by 9 grains of the powder. The efficacy of the gland does not seem to be lost by drying. The powder has been usually administered in the form of pills in daily doses of 1½ to 4½ grains, which amount may be gradually doubled. Dr. Byron Bramwell has derived the same results from the use of this preparation as from the gland itself or its extract.

Dr. J. D. Menzies, of the British Navy, reports several cases in which thyroid tablets were of advantage in precocious malignant syphilis, specific medication being suspended. Dr. N. Yorke-Davies asserts that in the treatment of obesity the use of these tablets is of great assistance. An extract made from the pituitary gland has been experimentally used in acromegaly.

Dr. Charles Macalester, of Liverpool, used preparations of the *Thymus Gland* with advantage in cases of pseudo-hypertrophic paralysis and general lymphadenoma.

Mikulicz, in ten cases of goitre and one of Grave's disease, obtained encouraging results from the use of thymus glands. He gave at one dose 10 or 15 grammes of raw sheep's thymus, finely cut up and spread upon toast. The quantity was gradually increased to 25 grammes.

A certain proportion of cases of diabetes are dependent upon or at least associated with disease of the pancreas. It has been demonstrated by Minkowski and Von Mering that removal of the pancreas causes glycosuria, irrespective of the nature of the diet. If, however, only a small proportion of the gland is left behind, diabetes does not develop. Furthermore, when pieces of the pancreas taken out of the abdominal cavity were grafted into the abdominal wall the advent of diabetes was prevented. Minkowski was led to believe that the pancreas performed some function indispensably necessary to the normal transformation of sugar within the organism. Professor Lepine has ingeniously argued that the pancreas generates a ferment which is necessary to assimilation of amylaceous foods. In view of these facts and hypotheses it was thought that the ingestion of the pancreas or preparations derived from that viscus might prove serviceable in the treatment of some forms of diabetes. Clinical experiments have been accordingly made in that direction and the results, which, unfortunately, fall far below expectation, have been published by Mackenzie, Hale-White, Neville, Wood, Battistini and N. S. Davis, Jr. The patients subjected to this method have generally experienced improvement of subjective symptoms, and some have gained in weight. The quantity of urine was not, as a rule, decreased; in one case reported it was even increased. The specific gravity and urea were uninfluenced, and in most cases the amount of sugar was not materially lessened. In one case ingestion of raw pancreas was followed by a severe erythema, accompanied by fever. We may, nevertheless, agree with the conclusion of Mackenzie: "For myself I would rather find an improvement in the general condition of the patient, increased strength, diminished thirst, and diminished quantity of urine as a result of treatment, than a mere diminution of the amount of sugar in the urine without such improvement. . . . It is evident that liquor pancreaticus is no specific, but the effects in these cases are encouraging enough to induce me to make further trial of it, and it is possible that in cases of true pancreatic diabetes the benefit might be greater."

*Bone-marrow* has been given with decided advantage in anæmia by Dr. J. Dickson Mann, of Manchester, and Professor Fraser, of Edinburgh. The part which marrow performs in the development of red corpuscles allows us to believe that in this substance we have gained a valuable remedy. Dr. Mann thinks that, as the tissue-forming power is more active in young than in old animals, the bones of the former are preferable as a source of marrow-extract. The extract which he employed was made from the heads of long bones of animals freshly killed, together with other portions of bone which contain red marrow. The bones are broken into small pieces and digested in glycerin with frequent agitation. Several days are required to accomplish complete extraction. The result, after filtration, is of a red or reddish-brown color and has no unpleasant taste or odor. It may be given in teaspoonful doses once or twice a day, either by itself or spread between thin slices of bread. Dr. Mann gives the results of a case of hæmophilia in which extract of bone-marrow was employed. A boy had been repeatedly treated for attacks of hæmorrhage which had left him the subject of pronounced anæmia. After a few weeks of treatment by bone-marrow a marked increase in the number of red corpuscles had occurred and his face acquired a healthy color. The same result was obtained in anæmia from other causes. Professor Fraser's case was one of pernicious anæmia, which had lasted for about four months when the patient entered the hospital. Treatment by means of iron and arsenic, both alone and combined, was altogether ineffectual, and the proportion of red globules and hæmoglobin steadily fell. After the administration of bone-marrow, which was given uncooked by the mouth, improvement was almost immediate, the quality of the blood began to change and at the end of six months the man was practically in a normal condition. Dr. W. G. Bigger has published the history of a case of leukæmia, which was apparently cured by the use of bone-marrow. It was given raw, spread upon thin slices of bread, and produced a remarkable improvement in the symptoms of the disease. The anæmia, dyspnœa and palpitation gradually disappeared and at the end of several months the boy was reported as perfectly well and the spleen of normal size The extract of bone-marrow has been employed by Filleau in tuberculosis.

An interesting field of investigation relates to the employment of *Blood Serum* as a bactericidal agent and to the modification of the blood by means of bacterial products and the production of immunity or cure. The fundamental principle is the alteration of the serum in such a manner as to render it destructive to certain specific bacterial products. This method of research has been applied experimentally to several dangerous infectious diseases. Tetanus was one of the first maladies to be thus studied. Behring has conducted a series of experiments with a view of first rendering an animal immune to tetanus by inoculation with the toxine elaborated by the bacillus of that disease, and secondarily, utilizing the serum of the immunized animal as a curative remedy for the established disease in another animal or in man. Immunity is secured by successive injections with the toxine of tetanus in gradually increasing doses. He believes that he has proved that injections of the immunized serum into the subjects of tetanus will cure that disease. The quantity of the modified serum must bear a certain proportion to the body-weight, so that much more is required for men than for small animals. Dr. Behring has succeeded in preparing a standard serum from the horse and this fluid is thought to convey a complete protective material to the system of the subject of the disease. The longer the stage of incubation and the more chronic the course of the malady the more favorable is the effect of the injections. A number of cases in the human subject have been reported in which recovery appeared to be due to the employment of this method. The injections are said to be in themselves harmless. In one of the successful cases the period of incubation was only six days. A modification of Behring's method by Tizzoni and Cattani consists in the injection of *Antitoxine* and has been applied, with apparent benefit, in tetanus of the human subject. These procedures and their results have not failed to meet with adverse criticism, but in view of the inadequacy of former methods the path of inquiry is certainly legitimate and it is probable that it will lead to an effectual means of combating a severe disease. The antitetanic serum has now been prepared in the dry state and sent out in tubes each containing 4 or 5 grammes, a quantity rather larger than the minimum dose regarded as curative in the case of a man. The dose varies according to the severity of the symptoms and is repeated for several days in smaller quantity. The dried serum is dissolved in distilled water and subcutaneously injected.

The same principles have been extended to the treatment of diphtheria. Behring has obtained a curative serum from the blood of sheep which have been rendered immune to diphtheria. Dr. Behring declares that it is innocuous when subcutaneously injected and this statement is corroborated by Professors Henoch and Heubner. This serum has been clinically employed by Heubner, Henoch, von Bergmann, Kossell and other observers with encouraging results. In a series of thirty cases the mortality was only 20 per cent. In another series of eleven patients there were two deaths, very nearly the same proportion. Three out of four tracheotomies recovered. The quantity injected at a time amounted to 5 fluidrachms. Goat's milk has also been used as a source of the anti-diptheritic serum and the milk of immunized animals contains the protective substances. In a more recently reported series of 220 cases the mortality was 44.9 per cent. among those tracheotomized and 23.6 per cent. in the cases which did not require operation.

Antidiphtherine is the name bestowed upon a preparation obtained by Professor Klebs from liquid cultures of the diphtheria bacillus. It occurs in two forms, representing the double and quadruple concentrations of the mother liquor of the cultures. Antidiphtherine is said to be destructive of the organisms which excite diphtheria. The preparations are used locally, the stronger being applied to the pharynx and the weaker to the larynx. V. G. Grigorieff, of Moscow, has recently reported some cases in which the application of antidiphtherine was of no avail. As a result of bacteriological experiments this writer asserts that Klebs's preparation is greatly less destructive to the diphtheria bacillus than corrosive sublimate.

Another antagonist to the diphtheritic infection is known as diphtheria-antitoxin, and is obtained from cultures by a process devised by Dr. Aronson. With this subtance and its effects in 128 cases reported by Dr. O. Katz, the mortality was only 13.2 per cent. During three preceding years the mortality had equalled 38.9 per cent. Dr. Aronson's solution is now prepared under his own direction by the Farbenfabrik vormals E. Schering ; and can be obtained in this country from Schering & Glatz, of New York. Several English physicians also have met with encouraging results from the use of this preparation.

Professor Roux, of Paris, and a number of English and American physicians have borne testimony to the efficacy of antitoxin injections in diphtheria. The author has had the opportunity of witnessing the early experiments with this remedy and is favorably impressed as to its value.

The use of diphtheria antitoxin is not altogether free from accident. The injections have been known to occasion, in different cases, erythema, urticaria, fever, swollen glands, arthritis, hæmaturia and albuminuria. They have also been thought to favor an increased tendency to paralysis. Several deaths have been reported directly following this method of treatment. Its value cannot yet be estimated. Nevertheless, the statistics collected by Foster are very suggestive. In a series of 2,740 cases of diphtheria treated with serum the average mortality was 18.54 per cent., while under former methods the death-rate in an equal number of cases was 45.36 per cent.

Doctors G. and F. Klemperer have essayed to obtain an immunized serum which should be curative of croupous pneumonia. Immunity was produced by injections of saliva from patients, a glycerin extract of pneumococci and, under certain conditions, bouillon-cultures. Immunized serum acts with more certainty when injected directly into the blood-current, and is believed to neutralize the poisonous products of the pneumococci. These investigators conclude that " we have in the serum of immune rabbits, the poisonous action of which we are able to destroy, a specific against pneumonia." The action of the material was tried in six patients suffering from pneumonia, and in every case there was a considerable reduction of temperature, pulse and respiration. The effect was manifested in from six to twelve hours, and in two cases the temperature remained normal, while in the remaining cases it rose at the end of six hours. It was ascertained that the fluid was without influence in cases of typhoid fever. In several cases treated by other observers an improvement followed the use of this method. In other cases failure has resulted. Time and a larger number of cases are needed before a definite judgment can be formed of the value of this method, but it is in accordance with scientific principles and tendency and may form, at least, a basis or point of departure for improved methods in the future.

In one case of pneumonia following influenza Fourrière derived benefit from the injection of 3 drachms of goat's blood, the operation being repeated four days later, the blood presumably acting by virtue of the bactericidal quality of its serum. Similar experiments have been made, with excellent results, in the treatment of glanders in the horse by means of immunized serum, but have not yet been extended to the human subject. Bernheim has made use of the same method in the treatment of more than 100 cases of tuberculosis and asserts that the effect was beneficial and states that in thirty patients the physical signs and symptoms had shown improvement for five months.

*Cholera* is another infection which it is sought to control by injection or vaccination with products derived from the cholera bacillus. Professor Klebs has separated from cultures a material which he terms anticholerin, a clear, brownish-yellow viscid liquid, which has been purified by removal of products deleterious to the animal organism. Anticholerin has no toxic effect upon man, but is thought to antidote the virus of cholera. A trial in a Hamburg Hospital, limited to serious cases, is said to have given encouraging results.

M. Haffkine has devised a method of vaccination with matter derived from pure cultures, and is now engaged in prosecuting experiments on a large scale in India, with what benefit remains yet to be seen. The theory is now advanced that the bactericidal power of blood serum resides in the nucleine, the reproductive element of blood-cells, and that the nucleine contained in immunized serum acts by stimulating the organs of sanguification. In response to this stimulation a fresh supply of nucleine is given to the blood.

A report upon the properties and uses of *Nucleine* has been made by Germain Sée. It has been obtained from the nuclei of cells, the pulp of the spleen, and the yolk of the egg. It is distinguished from other albumins or proteids by the presence of phosphoric acid. Nucleine is a colorless or yellowish powder, insoluble in water and alcohol, but soluble, after long boiling, in weak alkaline solutions and in water. It is given in the daily dose of 30 to 45 grains, and causes a considerable increase in the number of white corpuscles. Presumably for this reason it is efficacious in pleurisy, pneumonia and other infectious diseases. Nucleine is thought to be possessed of diagnostic value in latent tuberculosis, producing a transient fever with congestion of the apices. The action of nucleine upon micro-organisms has been studied by Dr. Victor C. Vaughan, who, by its use, succeeded in curing guinea-pigs suffering from tuberculosis produced by inoculation. This investigator also states that the injection of nucleine into guinea-pigs renders them immune to pneumonia. The same method of therapy has been applied to tuberculosis in the human subject, with very encouraging results.

Adamkiewicz has endeavored to arrest the progress of carcinoma by injection of a substance which he calls cancroin and which is a product of the living cancer cell. In respect to chemical composition, cancroin is identical with or closely related to neurine. As prepared, cancroin is an aqueous solution of neurine, to which carbolic and citric acids have been added. Blood serum or toxines from horses inoculated with erysipelas have lately been used by parenchymatous injection in carcinoma. The present reports are conflicting. A serum antidotal to streptococcus infection has been administered subcutaneously by Roger, with reported favorable results in several cases of puerperal fever, erysipelas and suppurative tonsillitis.

### **ANISUM** (U. S. P.).—**Anise.**

*Preparations.*

*Oleum Anisi* (U. S. P.),—Oil of Anise. *Dose*, ♏v–x.
*Aqua Anisi* (U. S. P.).—Anise Water. Oil (2 parts per 1000.)
*Spiritus Anisi* (U. S. P.).—Spirit of Anise (10 per cent.). *Dose*, fʒi–ij.
Anise also enters into paregoric elixir and liquor ammonii anisatus.

**Pharmacology and Therapy.**—The physiological effects of the fruit of Pimpinella anisum (Umbelliferæ) are due to its volatile oil, which is also found in star anise (Illicium verum). It is carminative, and, having an agreeable odor and taste, is much used in treating flatulent colic in infants. Anise may be ordered thus for the latter disease:—

| | | |
|---|---|---|
| ℞ | Magnesii carb., | ℈ij. |
| | Spt. chloroformi, | ♏v. |
| | Syrup. simplicis., | f℥ij. |
| | Aquæ anisi, q. s. ad | f℥ij. |

M. Sig.: A teaspoonful, for a child under one year, every hour.

In bronchial catarrh it is expectorant and slightly sedative, and is therefore used in cough mixtures. It has likewise been regarded as possessing the power to stimulate the secretion of milk.

### **ANTHEMIS** (U. S. P.).—**Chamomile.**

*Preparations.*

*Infusum Anthemidis.*—Infusion of Chamomile (ʒiv–Oj). *Dose, ad lib.*
*Oleum Anthemidis.*—Oil of Chamomile. *Dose*, ♏ii–viij.

**Pharmacology and Therapy.**—The flower-heads of Anthemis nobilis (Compositæ) collected from cultivated plants. The oil, which is the active principle, has a powerful lowering action upon the reflex excitability of the spinal cord. The hot infusion acts as an emetic in large quantities, but in 1- or 2-ounce doses it is aromatic and carminative, and favors perspiration and the action of the kidneys. It checks reflex cough. A very good combination after a severe cold, in simple fever, and often in acute rheumatism, is prepared by pouring a pint of boiling water over an ounce each of chamomile-flowers and the leaves and flowering tops of boneset. The patient should drink about one-half, hot, on retiring, as a diaphoretic, or the entire pint, should emesis be desired. A very excellent prescription for flatulence, and especially flatulent colic in children, is:—

℞ Infus. anthemidis,
Mist. sodæ menth., . . . . . . . . . . āā f℥iij.
M. Sig.: From one-half to two tablespoonfuls when necessary.

Locally, it may be used as a chamomile cataplasm, when heat and moisture, with some sedative action, are desired. It is used principally in domestic practice in the treatment of colds, bronchitis, and intestinal disorders, or dyspepsia. The oil has been proposed as an antidote in strychnine poisoning, and is useful in spasmodic asthma. The oil of chamomile, on account of its sedative action, is a very good drug to add to fatty preparations for various inflammations of the skin. Used in the ointments named, it will prove of value:—

℞ Ol. anthemidis, . . . . . . . . . . ♏v vel x.
Bismuth subnit., . . . . . . . . . ʒj.
Ungt. zinci ox. benz., . . . . . . . . ℥j.
M. Sig.: Apply well over the surface for erysipelas, acute eczema, and erythema.

℞ Ol. anthemidis, . . . . . . . . . . ♏vj vel xij.
Hydrarg. chlor. mitis, . . . . . . . . gr. x.
Ol. eucalypti, . . . . . . . . . . ♏v.
Lanolini, . . . . . . . . . . . ℥j.
M. Sig.: Use upon old muslin, and apply to the surface in infantile eczema and in seborrhœa.

**ANTHRAROBINUM.—Anthrarobin.**

**Pharmacology and Therapy.**—A yellowish powder, not soluble in acids or water, but soluble in alkalies, glycerin and alcohol. Anthrarobin is related to chrysarobin, for which it is a useful substitute as an application in skin diseases. It produces less irritation and staining than chrysarobin, and is said to have no toxic effects. Anthrarobin is excreted, for the most part, by the urine unchanged, though some of it is oxidized to form alizarin. It colors the skin yellow and the hair red. In psoriasis, tinea versicolor, and herpes it is used in 10-per-cent. ointment or alcoholic solution, which should be made fresh at least every week.

Anthrarobin can be prescribed thus at times with advantage:—

℞ Anthrarobini, . . . . . . . . . . ʒj.
Ungt. zinci oxidi, . . . . . . . . . ʒj.
Ungt. hydrarg. nitratis, . . . . . . . . ʒss.—M.
For chronic eczema and psoriasis.

℞ Anthrarobini, . . . . . . . . . . ʒj.
Ungt. hydrarg. oleatis (10 per cent.). . . . . ℥j.—M.
Use in tinea versicolor, as well as in ringworm and favus.

**Hydroxylamine Hydrochloride.**—An allied substance to anthrarobin and chrysarobin, this compound occurs in the form of colorless hygroscopic crystals, soluble in water, alcohol and glycerin. It has the advantage of not staining the skin, but is highly irritant and is capable of producing toxæmia. It has been used in psoriasis, lupus, scabies and vegetable parasitic diseases. Hydroxylamine hydrochloride should not be applied, to begin with, in greater strength than one-tenth of one per cent. dissolved in equal parts of alcohol and glycerin. The proportion may be gradually increased within the limits of tolerance. This compound is not adapted to internal use.

**ANTIMONIUM.—Antimony.**

*Preparations.*

*Antimonii et Potassii Tartras* (U. S. P.).—Tartar Emetic. *Dose*, gr. $\frac{1}{40}$–j.

*Antimonii Oxidum* (U. S. P.).—Antimony Oxide (rarely used), gr. ii–iij.

*Antimonii Sulphidum* (U. S. P.).—Antimony Sulphide, for making the Oxide.

*Antimonii Sulphidum Purificatum* (U. S. P.).—Purified Antimony Sulphide. Used in making Sulphurated Antimony.

*Antimonium Sulphuratum* (U. S. P.).—Sulphurated Antimony. *Dose*, gr. i–iij.

*Pulvis Antimonialis* (U. S. P.).—Antimonial or James's Powder (antimonii oxidum $\frac{1}{3}$, calcii phosphas $\frac{2}{3}$). *Dose*, gr. i–x.

*Pilulæ Antimonii Compositæ* (U. S. P.).—Compound Pills of Antimony or Plummer's Pills (containing sulphurated antimony and calomel, each, about gr. ss ; guaiaci, about gr. j). *Dose*, 1–2 pills.

*Vinum Antimonii* (U. S. P.).—Antimonial Wine (contains about 2 grains tartar emetic in each ounce). *Dose*, ♏ii–x.

*Unguentum Antimonii.*—Antimonial Ointment (tartar emetic 1, lard 4 parts).

*Emplastrum Antimonii.*—Antimonial Plaster (tartar emetic 1, Burgundy pitch 4 parts).

Tartar emetic also enters into syrupus scillæ compositus (U. S. P.), which is a syrup of squill and senega with tartar emetic. Mistura glycyrrhizæ composita (U. S. P.), or brown mixture, contains antimonial wine, 6 parts in 100, or tartar emetic, about gr. $\frac{1}{8}$ per ounce.

**Pharmacology and Physical Action.**—Tartarized antimony, or tartar emetic, is a powerful irritant, and when applied to the skin causes redness, followed by an eruption resembling small-pox. When swallowed, it is a depressing emetic, increasing the secretions of the intestinal tract, with occasional diarrhœa. It has a powerful diaphoretic action, and is eliminated by the bile, milk, sweat, urine, and intestinal secretions. Upon the circulation it is depressing, the heart's action becoming weak and irregular and the arterial tension lowered. The pulsations are likewise retarded. Respiration becomes slower and the bronchial secretions are increased. The brain is not directly affected, except that under certain conditions, especially when combined with opium, tartar emetic exerts a sedative action. Large doses diminish reflex excitability of the spinal cord, and may produce paralysis. A special action has been noticed upon the liver, the waste of nitrogenous elements being increased, with diminished oxidation of the non-nitrogenous elements. Excessive doses have a toxic effect upon motor nerves and muscles.

**Toxicology.**—When poisonous doses have been administered (gr. j or more), vomiting, with burning pain at the epigastrium, severe colic, purging, and small, frequent pulse and early collapse, with much prostration of muscular system, rapidly occur. Respiration is shallow and the patient suffers from cramping pain in the calves of the legs. In some cases furious delirium has occurred. Death is usually preceded by stupor or convulsions. Toward the close of the case the urine may become bloody and scanty or may be suppressed. In some instances vomiting is absent and the symptoms are those of profound nervous prostration. Repeated small doses of tartar emetic may occasion a chronic intoxication, evidenced by nausea, purgation, small, frequent pulse and, finally, death from exhaustion. In the last named class of cases the drug had been administered for criminal purposes. Absorption and elimination are rapid. The drug is eliminated by the mucous membrane of the stomach and bowels, but especially by the kidney. Death may result from exhaustion or from resulting gastro-intestinal inflammation. The antidote is tannic acid, which renders the salt insoluble, to be followed by demulcents and anodynes to relieve the pain. Depression is counteracted by alcohol and digitalis. Tartar emetic is incompatible with acids, alkalies and drugs containing tannic acid.

**Therapy.**—Tartar-emetic ointment is a powerful counter-irritant, but is seldom used on account of the danger of producing sloughing and scars. The treatment of inflammation by tartar emetic in large doses has been abandoned, but fractional doses (gr. $\frac{1}{40}$) alone or in combination with Dover's powder (gr. ij) or nitre (gr. iij) have proved very serviceable in sthenic pneumonia and in pleurisy. In bronchial inflammation with deficient secretion the wine of antimony or compound syrup of squills are frequently given. Dr. I. G. Davis writes with approval of the action of the golden sulphuret of antimony in chronic bronchitis. He administers it in doses of $\frac{1}{50}$ to $\frac{1}{30}$ grain triturated with sugar of milk.

Tartar emetic should not be given in croup (especially diphtheritic), as it is too depressing. For bronchitis in children, Ringer advises a solution of 1 grain to 1 pint of water, of which a teaspoonful is to be given every quarter- or half-hour. Tartar emetic should seldom or never be administered to infants or very young children.

This preparation has also been recommended in orchitis, mammitis and muscular rheumatism. It is useful in spasmodic asthma. A combination of tartar emetic and opium is very serviceable in the furious delirium which attends some cases of typhoid and typhus fevers. A similar condition in delirium tremens is relieved by the same treatment, which has also been used with success in puerperal mania. Ringer states that chorea is sometimes benefited by tartar emetic given in doses sufficient to produce vomiting once or twice a day. Administered in the same manner it has been found capable of relieving rebellious cases of lumbago and muscular rheumatism. Small doses of tartar emetic have an excellent effect in abating inflammation of the mammary gland. It is useful in tonsillitis and parotiditis. In acute gonorrhœa Surgeon-Major Lawrie regards 15 minims of antimonial wine, given every second hour, as an excellent remedy.

In some skin diseases, as chronic eczema, psoriasis, and other scaly disorders, the use of tartar emetic or antimonial wine in small doses frequently repeated is often of much service.

The so-called tolerance of antimony was due to the fact that after the vitality of the system became lowered by its action, large doses could be swallowed without producing vomiting.

**ANTIPYRIN.—Di-methyl-oxy-quinizine.**

**Dose,** gr. v–xxx.

**Pharmacology.**—Antipyrin is a synthetical product belonging to the aniline series, discovered by Dr. Ludwig Knorr, who has obtained a patent for the process of preparation and retains the manufacture under his own control. It occurs in the form of a white, crystalline powder, of a slightly-bitter taste, freely soluble in water, alcohol, and chloroform, and less readily soluble in ether. Antipyrin melts at 113° C. (235.4° F.) A solution of antipyrin added to a solution of ferric chloride gives rise to a dark-brown color. With spirit of nitrous ether it shows a green color-reaction, and is changed into iso-nitroso-antipyrin.

**Physiological Action.**—Upon the unbroken integument it is devoid of effect, but upon denuded or ulcerated surfaces its solution is said to exert an analgesic influence. Moderate doses do not produce any marked results either in animals or healthy men. Excessive doses cause slight depression of the normal temperature, cyanosis, chilliness, cardiac debility, and diaphoresis. Given to animals, it occasions epileptiform and tetanic convulsions. Reflex movements are increased by small and decreased by large doses. Antipyrin depresses the function both of sensory and motor nerve-trunks. Lethal quantities cause, in frogs, arrest of the heart in diastole. Arterial tension is decreased by large doses, unless convulsions occur, in which case it is increased. Small doses augment blood-pressure. The effect upon the blood-pressure is due to the direct stimulant or depressant influence of small or large doses upon the heart. A solution of antipyrin applied to divided blood-vessels arrests hæmorrhage. Respiration is unaffected by small doses; is first increased, but subsequently markedly decreased, by toxic doses. In fevered animals it causes a decided reduction of temperature, possibly by a direct action upon the heat-centres. Toxic quantities give rise to methæmoglobin in the blood. Antipyrin is possessed of some antiseptic power, and arrests fermentation. Absorption and elimination are rapid. Antipyrin is removed from the system by the kidneys, the urine being sometimes diminished and sometimes increased in quantity.

It is said that under the influence of antipyrin the urine contains a lowered proportion of substances representing nitrogenous tissue-change. Large doses cause a considerable decrease in the quantity of urine excreted.

**Idiosyncrasy and Toxicology.**—Many unpleasant and alarming, with sometimes fatal, effects have followed the administration of medicinal doses of antipyrin. Among these consequences are vomiting, profuse sweating, cyanosis, collapse, salivation, dyspnœa, and epileptiform convulsions. Dr. Perdriel suggests that antipyrin will be better tolerated by the stomach if prescribed with sodium bicarbonate and tartaric acid in capsules, owing to the influence of the nascent carbonic acid evolved.

The late Dr. P. Guttmann reported a case of poisoning from antipyrin, in which the symptoms very nearly resembled those of the algid stage of cholera. The fæcal evacuations were, however, formed. The quantity taken had been 2½ drachms in divided doses.

Herpetiform eruptions have been observed after the use of antipyrin. In some cases, again, small erosions or ulcerations have been produced. Morel-Lavallée has reported a case in which the prolonged injestion of antipyrin occasioned the development, upon the middle of the tongue, of a large spot of erosive glossitis which closely resembled agminated mucous patches of the tongue. Cutaneous eruptions due to antipyrin assume in different cases the form of erythema, urticaria, or pemphigus. At times a rash similar to that of measles is produced. This is easily removed by administering belladonna with the antipyrin or by giving a hypodermic injection of atropine.

M. Verneuil has, in two instances, observed partial gangrene follow the hypodermic injection of antipyrin. When nutrition is lowered this agent should not be injected at the seat of disease.

A number of fatal cases have been reported from medium doses of antipyrin, especially in children, old persons, and those suffering from cardiac debility or disease. In such cases, therefore, the remedy must be used, if at all, with extreme caution. Poisoning is shown by restlessness, anxiety, slow respiration, weak pulse, and vertigo. Treatment is by diffusible stimulants, heart tonics (strophanthus or nux vomica), and artificial respiration or inhalation of oxygen. Atropine will also aid in the treatment. Heat favors while cold retards the action of antipyrin. A habit of addiction is sometimes acquired and produces serious disturbance of the health, manifested by nervous irritability, loss of appetite and decided impairment of nutrition.

**Incompatibles.**—Antipyrin is incompatible with spirit of nitrous ether, calomel, the preparations of cinchona; hydrocyanic, nitric, and tannic acids; copper sulphate, ferrous sulphate, corrosive sublimate, sodium salicylate, tincture of ferric chloride, syrup of ferrous iodide, tinctures iodine, catechu, kino, and rhubarb.

**Therapy.**—The therapeutic effects of this substance may be summed up as antipyretic, analgesic, and antispasmodic. When antipyrin is given in febrile states, the temperature begins to descend, at the end of half an hour to an hour, and reaches its lowest point of descent in three to five hours. The average time during which the temperature remains depressed is from six to nine hours. It is preferable to administer the drug in a few large doses rather than in small amounts repeated. It should always be borne in mind, however, that large quantities are apt to produce collapse. The descent of temperature is usually, but not always, accompanied by profuse diaphoresis. In place of sweating, increased diuresis is sometimes observed.

Antipyrin is of especial value in hyperpyrexia. It may be used with advantage in previously vigorous subjects, in disease of a sthenic type, and when fever is, in itself, a source of danger. In typhoid fever it has often answered a very useful purpose in reducing extreme temperature. It may be used, also, in typhus fever, small-pox, and yellow fever. In scarlatina, accompanied by excessively high fever, we may have recourse to antipyrin. It has been found beneficial in erysipelas, reducing fever and apparently limiting the spread of the disease. In croupous pneumonia it reduces the rate of respiration as well as the temperature, but has no influence upon the pulmonary inflammation. Antipyrin is efficacious in the pneumonia and bronchitis of children. According to the comparative studies of the late Professor Demme, of Berne, relative to the use of antipyretics in the treatment of the febrile diseases of children, antipyrin is of particular value in cases of bronchopneumonia in which relapse and excessively high temperature are quite marked. He employed, in the first period of recurrence, antipyrin in aqueous solution, with a little sugar and a few drops of cognac. When given in this form it very seldom produces disturbance of the stomach, and very rarely fails to effect the desired reduction of temperature.* In the fever of pulmonary tuberculosis antipyrin is seldom likely to prove of advantage, on account of its depressant properties. In intermittent fever it is capable of reducing the fever, but not of preventing recurrence. Some writers have ascribed very excellent results to the use of this drug in puerperal fever.

Antipyrin is of efficacy in acute and subacute articular rheumatism, and is not infrequently successful in those cases in which sodium salicylate has failed. It not only reduces the fever, but also relieves the joint affections. Favorable reports have been made as regards its action in gout. Potter mentions a case in which an acute paroxysm of gout was ameliorated and shortened by antipyrin. A dose of 25 grains was given at first, and was followed by 10-grain doses every second hour until decided relief wasobtained. In chronic gout, also, it is reported to exert a beneficial influence. The acute paroxysm is ameliorated and shortened, and the course of the chronic form modified.

Antipyrin is efficacious in relieving pain in the various forms of neuralgia, but as a rule has little effect upon that due to inflammatory diseases. It is of particular avail when the neuralgia depends upon a gouty or rheumatic taint. It relieves the pain of malarial neuralgia, but will not prevent a recurrence of attacks. Hemicrania is often markedly relieved by the administration of this remedy.

According to Dr. Græme M. Hammond, it is especially efficacious in that form of migraine characterized by local heat of skin, flushed face and dilatation of the temporal artery. The same author recognizes its usefulness in sick-headache due to dietetic errors. A mixture or combination of antipyrin, caffeine and citric acid is prepared under the name of migranine and recommended as of marked efficacy in various forms of neuralgia, given in 15-grain doses. Excellent results have been obtained in sciatica from the use of antipyrin, especially when combined with quinine. It will often assuage the lancinating pains of locomotor ataxia. Pleuritic pains and the chest-pains of phthisis may be relieved by means of antipyrin. It has been used in dysmenorrhœa with asserted good success, and it has also been employed with a view to mitigating the pains of labor. Antipyrin has also been successfully employed to assuage the pain of hepatic colic.

The internal use of antipyrin is advocated by Blaschko in cases of pruritus dependent upon hysteria or other functional disorders of the nervous system. His statements have been confirmed by the experience of other observers.

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* See *Medical Bulletin*, March, 1891, p. 95.

Antipyrin mitigates the severity of a number of affections characterized by spasmodic action. In hysterical tremors and in chorea it is often of service. It has been seen to alleviate the paroxysms of whooping-cough, and in some instances it has seemed to shorten the course of the disease.

Galvagno praises the action of antipyrin combined with resorcin and states that the duration of pertussis is decidedly abridged by the administration of a mixture composed as follows:

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|---|---|
| ℞ Resorcin., | gr. xv. |
| Antipirin, | gr. xv. |
| Syrup. simpl., | f℥j. |
| Syrup. acaciæ, | f℥iijss. |

M. ft. sol. Sig.: From 3 to 5 dessertspoonfuls each day.

In many cases of epilepsy antipyrin is efficacious in reducing the number of convulsions. It is said to be particularly useful in epilepsy occurring at the menstrual epoch. Its value is enhanced by a combination with ammonium bromide, and it may be given, in the dose of 8 to 15 grains, thrice daily, with 20 grains of the latter drug. The mixture has been continued for long periods without producing bromism. Dujardin-Beaumetz and others have observed benefit from the use of antipyrin, in daily doses of 30 to 40 grains, in diabetes mellitus. In diabetes insipidus, also, good results have been reported. Antipyrin has been used, with asserted good results, by Dr. M. H. Feeny in subacute Bright's disease, and by Dr. Saint-Phillippe in infantile diarrhœa, accompanied by pain and indigestion. Alexandre Paris treated a case of tetanus successfully by means of antipyrin. Its favorable action in tetanus has been confirmed by Caviana and Venturoli. M. Clément considers it of value in promoting absorption of serous effusions in pleurisy, and it is said to allay the pain of glaucoma.

M. Guibert asserts that antipyrin arrests the secretion of milk, and may be safely administered for this purpose in doses of 4 grains every two hours. Others have successfully employed it for the same purpose. M. B. Martin has observed good effects from its use in exophthalmic goitre, urticaria, erythema nodosum, and senile pruritus. Dr. Gaudez has called attention to its usefulness in cases of idiopathic incontinence of urine in children. He combines a small quantity of sodium bicarbonate with each dose and lays stress upon the importance of administering the remedy at six and eight o'clock in the evening. He is accustomed to give the remedy in full doses according to age. It has been observed that in persons taking antipyrin the liability to take cold is increased. Antipyrin has given relief in some cases of lead colic. On account of its hæmostatic, antiseptic and analgesic properties antipyrin has proved an efficacious local remedy in a number of affections. Epistaxis is arrested by the application of the powder or an aqueous solution of 10 or 20 per cent. strength. The bleeding is checked without the formation of a clot. It is available after extraction of teeth, operations in the mouth and in minor surgery. Dr. Garner has reported a case in which uterine hæmorrhage yielded to an aqueous solution of antipyrin (1 drachm to 2 ounces of cold water) applied to the canal of the womb by means of a cotton swab. It has been used as an injection in hyperæsthesia or neuralgia of the urethra and bladder, and likewise in gonorrhœa. For use in gonorrhœa a solution may be made of ½ drachm to ½ pint of water. In cystitis the injection of a 4-per-cent. solution of antipyrin allays pain and checks spasmodic contractions. The fluid is allowed to remain within the bladder for ten minutes. In hypertrophy of the prostate gland the use of antipyrin, either administered by the mouth or brought into direct contact with the mucous membrane, diminishes the frequency of desire and renders the act of micturition more easy and less painful. Antipyrin is also of benefit in nephralgia as well as in painful organic affections of the pelvis of the kidney and the ureter, as inflammation, the presence of foreign bodies, etc.

A 5- to 15-per-cent. solution has been found an efficacious application in conjunctivitis, purulent dacro-cystitis, trachoma and pannus. Dr. E. B. Gleason has reported favorable results from the application of antipyrin in inflammatory conditions of the mucous membrane of the upper respiratory tract.* He found that the analgesic effect of solutions continues for several hours, and may apparently be prolonged indefinitely if reapplied at intervals. Antipyrin diminishes the reflex cough and asthma excited by certain nasal affections. Solutions of 1 to 3 per cent. generally give good results when used with an atomizer inside the nose. To the posterior wall of the pharynx a concentrated solution may be applied. Strong solutions may also be applied with benefit in cases of laryngitis. In painful laryngeal tuberculosis Dr. Neumann has advantageously insufflated a mixture of equal parts of antipyrin and powdered starch.

A solution of antipyrin, either alone or combined with cocaine hydrochlorate, has been recommended as an efficacious topical remedy in painful affections of the nose, pharynx and larynx, as well as in cases of operations upon those parts.

A valerianate of antipyrin and quinine has also been prepared.

Dr. J. Buisson has observed an admirable effect in nocturnal enuresis from the administration of three 10-grain doses of antipyrin at hourly intervals, beginning four hours before bed-time.

M. Vianna has ascertained that antipyrin is destructive to the bacillus of Löffler and its toxic products. He, therefore, suggests that the drug may prove useful in the treatment of diphtheria.†

Saint-Philippe regards antipyrin as of particular value in diarrhœa in children.

A mixture of antipyrin and salol has been found efficacious by Professor Labadie-Lagrave as a local application in uterine hæmorrhage. Antipyrin-salol, as the mixture is called, is made by heating together equal parts of the two substances until a well-defined brown color is produced. The effect of the salol is to liquefy the antipyrin. The fluid is applied upon cotton, is said to be free from danger, to cause no pain and to have a hæmostatic and antiseptic action.

**Naphthol-Antipyrin.**—M. G. Patein has succeeded in combining antipyrin with both alpha- and beta-naphthol, the former being a liquid and the latter a crystallized substance.

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* *New York Medical Journal*, October 29, 1892.

† *Le Progrès Médical*, April 2, 1892.

**Tolypyrin.**—This name has been given to a lately introduced synthetical preparation which differs from antipyrin by the substitution of a molecule of the methyl group for one of the hydrogen atoms in the phenyl group. Tolypyrin is a colorless, crystalline substance, of a bitter taste, soluble in water and alcohol, but almost insoluble in ether. It is colored violet by the ferric chloride and green by sodium nitrate, potassium nitrate, and by sulphuric acid. According to the investigations of Dr. von zur Mühlen, toxic doses of this compound paralyze the central nervous system but do not directly destroy the irritability of the cardiac muscular tissue. Clinical experiments were first made with this compound by Dr. Paul Guttmann, who found that it reduced the temperature in typhoid fever, pneumonia, scarlatina, facial erysipelas and phthisis. It was given in four doses of 15 grains each at hourly intervals. Tolypyrin lessens the pain and swelling of rheumatism. No untoward effects have been observed from its use and it is eliminated in the urine. It is also beneficial in neuralgia. Dr. Dornblüth has employed tolypyrin with advantage in neuralgia and other varieties of nervous pains and also in inflammatory pains, as angina and alveolar abscess, nervous insomnia, headache after epileptic attacks, and nocturnal enuresis in children.

**Tussol.**—This name is given to a compound of amygdalic acid and antipyrin. Tussol is said by Dr. Rehn to be useful in whooping-cough, reducing the frequency and severity of paroxysms. The substance is soluble in water and is given in doses of $\frac{3}{4}$ to $1\frac{1}{2}$ grains two or three times a day to children less than one year of age. From the second to the fourth year doses ranging from $3\frac{3}{4}$ to 6 grains may be employed, and for older children $7\frac{1}{2}$ grains. No ill effects have yet been observed from its administration.

**Ferripyrin.**—This designation has been bestowed upon a double combination of ferric chloride and antipyrin. Ferripyrin occurs in the form of an orange-red powder and is readily soluble in cold water. Unlike the ferric chloride the compound is not corrosive. Ferripyrin possesses decided astringent properties. It is used in watery solutions of 18 or 20 per cent. for the purpose of checking hæmorrhage. It may be given internally in the dose of 8 grains.

### APOCYNUM (U. S. P.).—Apocynum, or Canadian Hemp.

#### *Preparation.*

*Extractum apocyni fluidum.*—Fluid Extract of Apocynum. *Dose,* ♏v–xxx.

**Pharmacology and Therapy.**—The root of Apocynum Cannabinum (Apocynaceæ), a plant belonging to this country, contains **Apocynin** and **Apocynein**, the former soluble in alcohol, the latter in water. These principles in small doses act upon the circulation as a tonic, like strophanthus. In larger amounts they are emetic, cathartic, and diuretic.

Apocynum usually but not constantly increases arterial tension. It acts as a diuretic without irritating the renal epithelium. It is probable that the emetic and cathartic effects of this drug are due to apocyneine and its diuretic virtue to apocynin. The decoction of apocynum is irritant to the stomach and bowels, but the tincture is free from this disadvantage. The tincture (1: 10) has been employed in the daily doses of 60 to 90 minims. A decoction has been used in the dose of f℥i–ij in the treatment of dropsy.

Dr. W. T. Richmond regards apocynum as of value in the treatment of ascites, Bright's disease with or without dropsy, and valvular heart disease with general anasarca. He employs the fluid extract, beginning with 7 or 8 drops, and gradually increasing till the desired effect is obtained. Toleration is established by continued use, and the dose must therefore be raised from time to time. Dr. Richmond has also seen it of service in jaundice. In the dose of $\frac{1}{4}$ to $\frac{1}{2}$ grain apocynin has been used as an expectorant.

Dr. J. Glinski has found that apocynum relieves the functional disturbances which accompany organic heart disease and diminishes the area of dullness in dilatation. The drug seems to have no cumulative effect.

**ARECA.—Areca, or Betel-Nut.**

**Dose,** ♏v–xx (or ʒi–ij), as a vermifuge.

**Pharmacology and Therapy.**—The seed of Areca catechu (Palmaceæ) contains an oil and an acid constituent in addition to tannic acid. E. Jahns has extracted three alkaloids from areca nut,—arecoline, arecaine and a third, the quantity of which was too small to permit chemical investigation. He regards arecaine as the active principle. It is a crystalline body, soluble in water, insoluble in alcohol, ether and chloroform. Arecaine is a powerful tæniacide and poison, depressing the action of the heart and respiration, producing tetanic convulsions and increasing intestinal peristalsis. Powdered areca has for a long time been used as a tæniacide in veterinary practice. More recently this remedy has been used for the same purpose in the human subject. The fluid extract is the best preparation. Its administration should be preceded and followed by a purgative like castor-oil. Betel-nut is believed also to increase the secretions from the salivary glands, and has a slightly stimulating effect upon the cerebral centres.

**ARGENTUM.—Silver.**

*Preparations.*

*Argenti Cyanidum* (U. S. P.).—Silver Cyanide. *Dose*, gr. $\frac{1}{40}$–$\frac{1}{20}$.

*Argenti Nitras* (U. S. P.).—Silver Nitrate. *Dose*, gr. $\frac{1}{6}$–$\frac{1}{2}$.

*Argenti Nitras Dilutus* (U. S. P.).—Diluted Silver Nitrate (silver nitrate and potassium nitrate). Cast into moulds. External use.

*Argenti Nitras Fusus* (U. S. P.).—Moulded Silver Nitrate. Lunar Caustic for external use.

*Argenti Oxidum* (U. S. P.).—Silver Oxide. *Dose*, gr. ss–ij.

*Argenti Iodidum* (U. S. P.).—Silver Iodide. *Dose*, gr. $\frac{1}{8}$–$\frac{1}{4}$.

*Argenti Oleatum.*—For external use.

**Pharmacology.**—Metallic silver is a white metal taking a high polish, and not usually affected by acids or by oxygen, although readily tarnished by sulphur. It is official only in the form of salts, of which the nitrate is most largely used. Silver nitrate is an anhydrous salt which crystallizes in colorless rhombic plates. It is readily soluble in cold water, and has a metallic, styptic taste. Upon the addition of hydrochloric acid or a soluble chloride to a solution of the nitrate, a white, curdy precipitate is formed. This precipitate is wholly soluble in ammonia. The crystals, fused and cast into moulds, present the form of round, grayish sticks. The cyanide is convenient for the extemporaneous preparation of hydrocyanic acid by adding an excess of some mineral acid to the solution containing this salt. Silver wire is used in surgery for sutures and for canulæ for tracheotomy, catheters, etc.

**Physiological Action.**—Silver nitrate, in weak solutions, acts as an astringent, and, in substance, coagulates the albumin of the tissues and destroys their vitality, acting as a caustic. The mitigated stick of lunar caustic is mild and superficial in its action; the pure nitrate may cause sloughing or ulceration. One objection to its use is the discoloration it leaves behind, the skin becoming black after exposure to the light. When the physician's fingers are stained with nitrate of silver in making an application, the color may be removed by at once washing with a solution of cyanide of potassium. According to Hahn, the stains may be removed from the skin or clothing by a solution containing 75 grains each of corrosive sublimate and ammonium chloride in 10 drachms of distilled water. Local applications of silver nitrate whiten mucous membrane. When swallowed, symptoms of irritant poisoning appear, with pain, distress, and vomiting. Common salt is the antidote, and vomiting should be encouraged by administering hot salt water; after cleansing the stomach the bowels should be emptied by oil. When any of the silver salts (but especially the nitrate) have been taken for a length of time, a slate-colored line appears along the gums and upon the ocular conjunctiva, and soon afterward the general surface of the body becomes dingy or slate-colored, due to the deposit of metallic silver in the pigment-layer of the skin and in all the constituents of the skin below the Malpighian layer. This condition is known as **Argyria,** and is permanent. The patient should be carefully observed during the administration of silver, and the remedy from time to time intermitted. It is expedient, also, to guard against accumulation by an occasional purge. The uninterrupted use of silver for a longer period than six weeks in unwise. In medicinal doses the silver salts act as a tonic to the nervous system, and changes occur in the blood; tissue change is increased; the flow of bile is also increased, and in larger doses there is embarrassment of the respiration, depression of the circulation, and reduction of temperature. Tetanic convulsions or paralysis may be produced by overdoses, the paralysis being of central origin.

**Therapy.**—Silver nitrate is used locally in 1-per-cent. solution dropped into the eyes of newborn infants to prevent purulent conjunctivitis (ophthalmia neonatorum) after the method of Credé; but it has fallen into disuse in treating conjunctivitis in the adult, owing to the discoloration which follows its use. The mitigated stick is a good application to granular lids, chancroids, small-pox vesicles (in order to prevent pitting), and in general to excite a healthy action of granulating surfaces. In gynæcology, the lunar caustic, in solid form, is used in chronic cervical catarrh and in venereal sores. An application of the solid stick to the scrotum has a good effect in acute epididymitis or orchitis; also in lymphangitis of the forearm, from a poisoned wound of the finger. Thoroughly applied to the wound, it is claimed to be a complete protection against hydrophobia. For nasal catarrh it may be mixed with some gum acacia, pulverized, and blown into the throat or nose. In pharyngitis, tonsillitis, and laryngitis, solutions (made with water or spirit of nitrous ether of gr. xx–xl per ounce) are applied with excellent results; Dr. Horace Green advocated the stronger solution applied with a probang to the larynx in diphtheritic croup. In appropriate cases, these solutions are valuable in gonorrhœa, urethritis, etc.

An abortive method of treating gonorrhœa has had its advocates and consists essentially in the injection of a strong solution of silver nitrate during the early stage of the disease. Professor Diday, who was in the habit of treating gonorrhœa in this manner, insists upon the importance of the following points: the strength of the solution should be 24 grains to the ounce of distilled water, which, in most cases, will cause but slight pain at the moment of injection; if sharp pain is produced immediately the fluid should not be allowed to remain for more than 15 or 20 seconds; when the pain is moderate is is allowed to remain for 1 or 2 minutes, according to the tolerance. Diday states that he has often succeeded in aborting the disease, even when it was in rather an advanced stage.

In erysipelas, the disease may sometimes be arrested by outlining it with silver nitrate. It has also been used with good results in pruritus vulvæ, herpes, eczema, and lichen when they occur in circumscribed patches. Boils may sometimes be aborted in this way, and a stye on the eye may be checked by an early application. Buboes are treated by Cordier, whether suppuration has occurred or not, by puncture, through which a 2-per-cent. solution of silver nitrate is injected. Recovery is said to be rapid and the formation of an unsightly scar is avoided. After disinfection of the wound Simmons recommends the injection of a solution of silver nitrate with a view to preventing the development of tetanus from punctured wounds. The solution which he employs contains 10 grains to the ounce. Dr. Lazzaro proposes silver fluoride as an efficient local application in anthrax. It is a brown or blackish-brown hygroscopic mass, readily soluble in water, antiseptic, equal in caustic effect to the nitrate and is destructive to the anthrax bacillus while harmless to the human organism.

On account of the staining of the skin, silver nitrate is but little used internally, although it has acknowledged effects upon the nervous system. Silver oxide is claimed to be free from this objection and equally efficient, especially in the early stages of locomotor ataxia and in epilepsy. A double salt, the sodium and silver hyposulphite, has been recommended by Curci and others as efficacious in locomotor ataxia, and free from the disadvantage of staining the skin. It is very soluble in water, does not coagulate albumin and may be given by the mouth in doses of $\frac{3}{4}$ to 3 grains or hypodermically from $\frac{1}{6}$ to $\frac{3}{4}$ grain in the course of the day. In gastralgia, also, the silver salts are sometimes remarkably curative. They have effected improvement, likewise, in chronic gastritis and ulcer of the stomach. The silver nitrate has been successfully given for the purpose of allaying yeasty vomiting. When, in typhoid fever, symptoms of irritation in the alimentary tract become prominent, and peritonitis or hæmorrhage appears imminent, the following prescription is used by Pepper, in the Philadelphia Hospital:—

| | |
|---|---|
| ℞ Argenti nitratis, | gr. ij. |
| Mucilag. acaciæ, | f℥ij. |

M. Sig.: A teaspoonful three or four times daily, combined with tincture of opium or belladonna, if necessary, for diarrhœa or constipation.

Silver nitrate sometimes yields good results in enteritis or colitis, especially if ulceration is present. Silver nitrate or oxide may also be given as follows:—

| | |
|---|---|
| ℞ Argenti nitratis, | |
| Extracti opii, | āā gr. ij. |

M. et ft. pil. no. viij.
Sig.: A pill every four hours, for gastric ulcer.

| | |
|---|---|
| ℞ Argenti oxidi, | gr. ij. |
| Ext. belladonnæ fol. alc., | gr. j. |
| Ext. gentianæ, | ℈j, |

M. et. ft. pil. no. xvj.
Sig.: A pill three times a day.

An efficient prescription for neuralgia and chorea:—

| | |
|---|---|
| ℞ Argenti nitratis, | gr. iij. |
| Syrup. ipecac., | f℥j. |
| Morphinæ sulphatis, | gr. j. |
| Mucil. acaciæ, | f℥ij. |

M. Sig.: A teaspoonful in water three times a day, before meals. Exerts marked influence over chronic diarrhœa, especially of phthisis.

The solid stick is useful in restraining the bleeding from leech-bites. When, in the course of a chronic illness, bed-sores threaten to form, the local application of a solution containing 20 grains of silver nitrate to the ounce will avert the mischief. Ringer has found the same salt useful in whooping-cough. A solution may be applied to the throat by a mop or sponge, or it may be used in the form of a spray. The latter method, however, is inapplicable to children less than three years of age. The stain produced, moreover, is a serious objection to the spray. A strong solution, or the solid stick, is a good stimulant to indolent ulcers and to ulcer of the rectum. A 40-grain solution in nitrous ether has been used in tinea trichophytosis. A solution containing from 20 grains to 2 drachms to the ounce of water may be successfully employed by injection of small quantities (5 to 10 drops) into the sac of a hydrocele or cystic tumor. A sponge probang saturated with a very weak solution of silver nitrate is sometimes of service in spasmodic stricture of the œsophagus. Applications should be made occasionally, at intervals of several days. In pseudo-membranous enteritis it is a good practice, in the intervals of paroxysms, to irrigate the bowel with a 5 to 10-grain solution of silver nitrate. Prolapsed rectum, especially in children, is benefited by cauterization with silver nitrate.

In gastric catarrh, the gastro-intestinal catarrh of phthisis, ulcer of the stomach, or chronic diarrhœa, we may combine it as follows:—

| | |
|---|---|
| ℞ Codeinæ, | gr. iij. |
| Argenti nitrat., | gr. vj. |
| Pulv. acaciæ, | q. s. |

Div. in pil. no. xij.
Sig.: Give one every two to four hours.

In catarrhal jaundice silver nitrate has been given in $\frac{1}{12}$-grain doses with advantage.

In pill form the effect is more sustained, and the remedy can be given in larger doses than when in solution. When used in affections of the stomach, the remedy is best given a half an hour or so before meals, in order that the local effect may be secured.

Dysentery, with ulceration of the large bowel, is very much benefited by large injections of weak solutions of silver nitrate (gr. $\frac{1}{8}$–$\frac{1}{4}$ to the ounce of mucilage). Bartholow advises the internal use of the nitrate combined with opium in addition to the treatment by injections. According to the same writer, either the nitrate or the oxide is useful in nervous dyspepsia, cholera infantum, and jaundice depending upon catarrh of the bile-ducts. Silver is sometimes beneficial in chorea. Silver oxide is occasionally able to check profuse perspiration, and may prove useful in menorrhagia. The nitrate has given relief in obstinate enteralgia.

Dr. Crocq, of Brussels, claims that silver nitrate is a valuable remedy in phthisis, promoting appetite and digestion, diminishing cough, expectoration and night sweats. He administers from $\frac{1}{3}$ to $\frac{1}{7}$ grain during the day. Mr. P. A. Brady, forty years ago, regarded this salt as of great value in the treatment of phthisis. He was accustomed to give it in doses of $\frac{1}{6}$ grain combined with 3 grains of Dover's powder three times a day.

Various methods have been proposed for the removal of the blue discoloration produced by silver. Unfortunately, none has proved reliable, and in the vast majority of cases the stain proves permanent. It has been claimed that blistering will lighten the color. Dr. Eichmann states that in two cases the color disappeared after the use, four times a week, of potash and soap baths. Potassium iodide has been given internally for the same purpose. Argyria is by no means as common now as formerly, since it is no longer so largely employed in the treatment of epilepsy and locomotor ataxia.

**Ethylenediamine Silver Phosphate Solution.**—This new combination is brought forward as a substitute for the silver nitrate. Ethylenediamine is a clear, colorless fluid, readily soluble in water, of an alkaline reaction and ammoniacal odor. It has the power of dissolving albumin and has but a slight caustic action. The solution of ethylenediamine silver phosphate is a clear and colorless liquid, and, according to Dr. Schaffer, possesses bactericidal properties which will render it valuable in the treatment of gonorrhœa and diphtheria. This fluid contains 8 per cent. of silver phosphate and is decomposed when it is exposed to the light.

**Argonin.**—An organic combination of silver with casein has been introduced under this name by Drs. Röhmann and Liebrecht. Argonin contains one-fourth the amount of silver present in the nitrate. It is soluble in water, non-irritant, not precipitated by salt, and is thought to be antidotal to the gonococcus.

**ARASA.**

This plant is a native of Brazil and Uruguay. The portion used is the bark of the root. It is employed in South America in cases of metrorrhagia, 2 grammes of the bark being boiled in a cupful of water and administered for several days before and during the menstrual period. The taste is said to resemble that of cascarilla, and no unpleasant secondary effects have been observed.

**ARISTOL.—Dithymol Di-iodide.**

**Pharmacology.**—Aristol is made by adding a solution of iodine in potassium iodide to an aqueous solution of sodium hydrate containing thymol, when it is thrown down as an abundant, red-brown, amorphous precipitate. In the reaction an iodine atom is substituted in hydroxyl. The proportion of iodine present in aristol has been estimated by Carius at 45.80 per cent.

Aristol is insoluble in water and glycerin, slightly soluble in alcohol, but readily so in ether. The addition of alcohol precipitates it from its ethereal solution. It is very soluble in chloroform and oils, but the solution must be made by friction without the aid of heat, since aristol is decomposed by the action of heat or of light. The character of its chemical combination renders it an unstable compound. Aristol is decomposed in contact with ammonia, alkalies and carbonates, corrosive sublimate, metallic oxides and starch. It possesses but a slight odor, which agreeably recalls that of thymol. In this respect it is decidedly preferable to iodoform.

**Physiological Action.**—Aristol adheres very readily to the skin, and is, therefore, well adapted for use as a dusting-powder. It is free from irritant action upon the unbroken skin. Applied to the mucous membrane, it promotes secretion. It is not absorbed either through mucous membranes or raw surfaces, and therefore produces no toxic effect. It has been given internally by Neisser with no appreciable result. This experimenter found that, when dissolved in suitable menstrua and injected into the blood, it became decomposed and iodine appeared in the urine.

The absence of disagreeable odor and its freedom from toxic influence are features which give aristol a great advantage over iodoform, and, from the evidence now before us and continually accumulating, it seems probable that in a wide range of conditions it may eventually supplant the latter substance.

**Therapy.**—The attention of the profession was first drawn to aristol by Dr. Eichhoff, of Elberfeld, who warmly commended its local action in a number of affections. His experiments have been confirmed by various observers, both in Europe and America.

Aristol is remarkably efficacious in promoting rapid cicatrization. Varicose ulcers of the leg, so common in the old or decrepit, heal very quickly under the application of an ointment containing 10 per cent. of aristol. A 5-per-cent. ointment proved equally efficacious in the case of open buboes. In lupous ulcers a smooth, sound, and healthy scar is at times obtained by the use of aristol, either as a powder or in the form of an ointment. Eichhoff points out the fact, which was confirmed by the investigations of Neisser, that the remedy is ineffective in lupus which has not advanced to the ulcerative stage. The explanation is that aristol has no corrosive power. It is not capable of destroying or penetrating an intact cuticle, and therefore can exert no influence upon the cells of the lupous nodule. Its action is not upon lupus *as such*, but upon the ulcer which is the consequence of an advanced stage of the disease. Eichhoff in several cases anticipated the result by the formation of an artificial ulcer by the use of the sharp spoon or Pacquelin's cautery. He found, moreover, that aristol failed in ulcerated lupus of the nose, and suggests that in this situation the bacilli are imbedded in and protected by the cartilage, and are not in a position to be attacked by aristol. In lupus erythematosus, likewise, the affected skin must be acted upon by some escharotic as a preliminary, after which aristol may promote a speedy cure. In scrofuloderma excellent results have been obtained by the use of the remedy under discussion. Overhanging edges should be trimmed away, and if the granulations are flabby the base of the ulcer should be scraped before the aristol is applied. Vinal recommends a 20-per-cent. ointment of aristol in the treatment of fissured nipples during lactation.

Upon the ulcers of late secondary or tertiary syphilis this remedy exhibits a remarkable influence. Eichhoff, indeed, expressly asserts that as a local application in tertiary syphilis it is superior to any other agent. It is of equal value in the ulcers of the congenital form of the disease, and in the large, moist papules of hereditary or acquired syphilis. Another manifestation of this malady, which may be amenable to the influence of aristol, is ozæna. Within a few days the fœtor and discharge may disappear and scabs cease to form. Simple ozæna also is notably improved by the same treatment. The insufflation of aristol has been found beneficial in epistaxis. In dry rhinopharyngitis, atrophic rhinitis, and dry laryngitis the insufflation of aristol is of decided benefit.

Dr. John B. Brooke, of Reading, Pa., found an ointment containing 40 grains of aristol to the ounce rapidly beneficial in an obstinate bedsore. This agent is likewise of service in the treatment of burns. Brocq and others have witnessed cicatrization of ulcerated epithelioma due to the action of aristol. Gaudin describes a case of epithelioma of the uterus and vagina in which the odor was extremely offensive. A cotton tampon coated with aristol-powder soon removed the odor and caused the discharge of pieces of the growth. Professor William F. Waugh * relates a case of ulcerated scirrhus of the breast in which a surprising improvement was effected within a few days by aristol thickly dusted over the surface. In a week, granulations of healthy appearance developed upon the surface of the sore.

The writer is by no means desirous of advocating injudiciously and prematurely the virtues of any medicament, especially in reference to such a malign affection as cancer. But, from the testimony of excellent observers and from his own clinical experience, aristol appears to have a power not hitherto exhibited by other remedies, that of originating apparently healthy granulations and cicatrization of some cancerous ulcers. Eichhoff obtained a prompt cure of chancres of the penis and lips, but strangely enough saw no good effects from the use of aristol in chancroid. His experience as regards chancroid has been corroborated by Neisser. It is reported that this drug is very good in ulcers of the cornea, in an ointment of 1 to 2 grains to the drachm of lanolin and benzoinated lard. He has derived great benefit from it in pure powder on the ulcers of the lid and brow; it causes such to heal up very quickly. It acts, he adds, like iodoform, and has not such a very penetrating and unpleasant odor.

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* *Times and Register*, September 29, 1890, p. 258.

Dr. James Wallace has employed aristol powder with success for the purpose of clearing up corneal opacities in the chronic stage of interstitial keratitis. This substance is likewise an excellent and prompt antiseptic. In tinea tonsurans and tinea sycosis it generally proves efficient in the form of an ointment containing from 5 to 10 per cent. In favus, however, it is of little or no avail. In balano-posthitis, after the preputial sac has been thoroughly cleansed, the application of aristol in the form of a dusting-powder is of decided service.

In gonorrhœal urethritis in women, aristol made into cylinders with oil of theobroma was curative in six out of nine cases treated by Eichhoff. In acute gonorrhœa of the male, a 5-per-cent. solution of aristol in oil seemed to be productive of no good results. Nevertheless, when abandoned and another remedy substituted, the patients made a more rapid recovery than those in whom no aristol had been used. In a case of gleet of twenty years' standing, Professor Waugh saw an unusually rapid disappearance of the discharge after the introduction of a very small quantity of aristol mixed with liquid and solid vaseline to the consistency of thick cream. The same observer reports a case of endometritis with dysmenorrhœa rapidly relieved by a tampon dipped in glycerin and rolled in aristol-powder, intra-uterine applications of the same remedy being repeated twice a week. Gaudin mentions a case of endometritis following abortion, in which treatment by aristol was soon followed by improvement. Similar cases have been cited by Swiecicki, who was the first to publish the results of aristol treatment in gynæcology. Eichhoff, Lassar, Gaudin, Neisser, and others have witnessed decided improvement from the use of this agent in psoriasis. The author has found it at least as beneficial as chrysarobin, while, unlike the latter, it does not stain the skin and clothing, and is free from the danger of exciting conjunctivitis. In eczema squamosum, likewise, notable amendment has attended its use. It serves a good purpose also in erysipelas. Rohrer has employed aristol by insufflation with very satisfactory results in subacute and acute inflammation of the middle ear. The discharge speedily diminished, the mucous membrane became smooth, and the perforations healed. Inflammation of the external ear was also very amenable to its influence. Guerra y Estape obtained excellent results in twenty cases of disease among children, to whom iodoform is so repugnant, and, in fact, dangerous. An extensive ulcer over the parotid gland healed in seven days, a chronic coryza in six days, and in the case of an unhealthy ulcer over the thorax suppuration ceased in twenty-four hours and cicatrization soon began. No ill effects were seen in any of the cases. Pollack, of Prague, has found aristol to possess marked sorbifacient virtues. An enlarged thyroid gland was perceptibly decreased in less than two weeks and soon afterward the neck was quite normal in size. In epididymitis, chronic tubercular adenitis of the neck, parametritis, and typhlitis, equal success attended the use of the remedy.

The author* has made use of aristol with advantage in hyperidrosis and bromidrosis, either prescribed alone as a dusting-powder or combined with boric acid. It restrains profuse secretion and overcomes offensive odor. An ointment containing ½ drachm of aristol to the ounce of excipient is serviceable in acne and rosacea. Dr. Kejzlar has employed aristol in dentistry on account of its antiseptic properties in gangrenous pulps, in disinfecting the root canals and carious cavities, before introducing the filling, etc. On gangrenous pulps he dusted aristol by means of a fine brush; for cleansing the canals and cavities he used a 10-per-cent. solution in ether. The ether evaporates and the aristol is left in the cavity as a uniform coating. Dr. B. M. Randall, of Graceville, Minn., derived satisfactory results in chronic dysentery from the use, three times daily, of a suppository containing 3 grains of aristol and ⅓ grain of morphin. M. Nadaud has reported some encouraging results from the hypodermic injection of aristol in pulmonary tuberculosis. He makes use of a 1-per-cent. solution of the drug in sterilized oil of sweet almonds and injects 1 c.c., or 16 minims, every day. His experience was communicated to the Academy of Medicine, September 15, 1891. He had at that time treated twenty-three patients solely by this method and had observed that improvement generally took place on the sixth or seventh day; and that by the end of a month the patient had gained in weight. The amelioration had continued for three or four months after discontinuance of the treatment.

At the Hôpital Saint-Louis, in Paris, an aristol plaster has been used. The following is the method of its preparation: Finely-powdered aristol is mixed with a small quantity of oil, and to the mass is added lanolin and caoutchouc plaster, previously cooled and made very fluid by the addition of benzine. The benzine is sufficiently evaporated to leave a preparation suitable for spreading upon muslin. An aristol gauze has lately been brought into use as an antiseptic dressing. It is made by impregnating gauze with an ethereal solution, and contains from 15 to 30 grains per square yard.

The following formulæ containing aristol will be found of great service:—

℞ Aristol, . . . . . . . . . . . ℥ss.
Pulv. zinci carb. impur., . . . . . . . ʒss.
M. Sig.: Dust over the surface. Employ as a dressing to wounds; also, in excessive sweating and oily state of the skin.

℞ Aristol, . . . . . . . . . . . ʒss.
Ungt. zinci oxidi, . . . . . . . . . ℥ss.
Ungt. plumbi subacetatis, . . . . . . . ʒss.
M. Sig: Apply well to the surface. Beneficial in infantile and chronic eczema and in psoriasis.

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* See paper on Aristol in the *Medical Bulletin*, June, 1891.

℞ Aristol, . . . . . . . . . . . . . ʒj.
Camphoræ,
Lupulini, . . . . . . . . . . . āā gr. xxxvj.
Ol. theobromatis, . . . . . . . . . . . q. s.
M. et ft. suppos. no. xij.
Sig.: Insert one in the vagina for leucorrhœa and pruritus. Employ also in pruritus of the bowel.

℞ Aristol, . . . . . . . . . . . . ʒss.
Ungt. aquæ rosæ, . . . . . . . . . . . ℥ss.
Ungt. zinci oxidi, . . . . . . . . . . ʒss.
M. Sig.: Use night and morning to the parts. Valuable for acne and rosacea.

℞ Aristol, . . . . . . . . . . . . ʒss.
Camphoræ, . . . . . . . . . . . . gr. x.
Lanolini, . . . . . . . . . . . . ℥ss.
Ungt. zinci oxidi, . . . . . . . . . . ʒss.
M. Sig.: For application to fissures of the nipples, hands, feet, and genital organs.

℞ Aristol, . . . . . . . . . . . . . gr. 1.
Ext. belladonnæ folior alc., . . . . . . . gr. iiss.
Ol. theobromatis, . . . . . . . . . . . q. s.
M. et ft. suppos. no. x.
Sig.: Insert one in the bowel when necessary, to relieve pain. For cystitis and prostatitis.

Dr. Brooke has employed aristol internally with decided advantage in the summer diarrhœa of children, typhoid fever, in simple and complicated diarrhœas and dysentery. He regards it as valuable in cases of offensive and bloody muco-purulent discharges from the bowel. He gave it in doses of 5 grains to the adult and in proportional doses to children according to age.

**Iodonaphthol.**—This name has been bestowed by G. Braille upon a new body, analogous to aristol, prepared by adding an aqueous solution of iodine and potassium iodide to a solution containing beta-naphthol and potassium hydrate. To this mixture is gradually added a solution of sodium hypochlorite containing ten times its volume of combined chlorine. The new body occurs in the form of a greenish-yellow pulverulent precipitate, which is odorless and tasteless, insoluble in water, partially soluble in alcohol and acetic acid. It soon darkens upon exposure to light.

## ARNICA (U. S. P.).—Leopard's Bane.

### *Preparations.*

*Tinctura Arnicæ Florum* (U. S. P.).—Tincture of Arnica-Flowers (20 per cent.) *Dose*, ♏x–xxx.

*Tinctura Arnicæ Radicis* (U. S. P.).—Tincture of Arnica-Root (10 per cent.). *Dose*, ♏v–x.

*Extractum Arnicæ Radicis* (U. S. P.).—Extract of Arnica-Root. *Dose*, gr. i–ij.

*Extractum Arnicæ Radicis Fluidum* (U. S. P.).—Fluid Extract of Arnica-Root. *Dose*, ♏v–xx.

*Emplastrum Arnicæ* (U. S. P.).—Extract, 1 part; resin plaster, 2 parts.

*Infusum Arnicæ Florum* (1 in 5 of water). For local use.

**Pharmacology.**—Arnicæ Flores, the flower-heads, and Arnicæ Radix, the rhizome and rootlets of Arnica Montana, are both official; they belong to the natural order Compositæ, indigenous to Northern Europe and Siberia, also in the northwestern part of the United States. The flowers are orange-yellow, disk shaped with rays, of feebly aromatic odor and bitter, unpleasant taste. Trimethylamine has been obtained from the flowers, but the principal constituent to which its local effects are due is probably a volatile oil; besides this there is a glucoside, **Arnicin,** and also inulin, tannic acid, resin, and other unimportant elements. According to some writers, arnica also contains two alkaloids, arnicine and cytisine, the latter of which is apparently identical with the principle of the same name derived from the laburnum.

**Physiological Action.**—Applied to a delicate skin, arnica produces redness and inflammation resembling erysipelas. A pustular eruption may also be produced by the application of this remedy. It acts as a counter-irritant and revulsive. Internally, in small doses, it has some stimulating influence, raising the blood-pressure and the action of the heart, producing a feeling of warmth over the body and increasing the secretions. It has been shown that small quantities of arnica exert a stimulating influence upon the pneumogastric nerves. Larger doses cause depression, paralysis of the vagi, followed by vomiting and collapse. Death results from the cessation of the heart's action, and in part from the accumulation of carbonic acid in the blood. Atropine is the physiological antidote, with stimulants, artificial respiration, and counter-irritation.

**Therapy.**—Arnica is largely used in domestic practice, and by irregular practitioners as a remedy for sprains, contusions, myalgia or rheumatism and local paralysis, and it is also believed to have some influence over hæmorrhages. The plaster is useful for external disorders. It is asserted by some authorities that any power it may have in causing absorption of ecchymosis is really due to the alcohol of the tincture which is commonly used. The author, from clinical experience, believes that arnica has most effective local result upon the tissues, particularly in rheumatism, boils, abscesses, and in all thickened conditions of the integument. The following combinations are especially of value :—

℞ Ext. arnicæ radicis fl.,
Lin. saponis,
Tinct. opii, . . . . . . . . . . āā f℥j.
M. Sig.: Apply with friction for boils, abscesses, and thickening of the skin

℞ Ext. arnicæ radicis fl.,
Aquæ hamamelidis dest., . . . . . . . āā ℥iij.
M. Sig. : Use on muslin or lint for hæmmorrhages. A rheumatic joint may be covered with cloths saturated with the arnica and witch-hazel, the combination often being more effective when applied hot.

Arnica has been used internally in large doses in mania with high arterial excitement, in delirium ebriosum, and in acute rheumatism in sthenic subjects. Small doses of the tincture are useful in fever attended with much depression. This remedy may likewise be beneficially employed in chronic diarrhœa, chronic dysentery, and in various forms of hæmorrhage. It has been thought useful in paralysis of the bladder.

### ASAFŒTIDA (U. S. P.).—Asafetida.

**Dose,** gr. x.

*Preparations.*

*Emulsum Asafœtidæ* (U. S. P.).—Emulsion of Asafetida (4 per cent.). *Dose,* f℥ss-j.

*Mistura Magnesiæ et Asafœtidæ.*—Mixture of magnesia and Asafetida. Dewees's Carminative (tr. opii deod., 1 per cent.). *Dose,* f℥ss-j.

*Tinctura Asafœtidæ* (U. S. P.).—Tincture of Asafetida (20 per cent.). *Dose,* fʒss-j.

*Pilulæ Asafœtidæ* (U. S. P.).—Pills of Asafetida (each containing gr. iij asafetida). *Dose,* 1–4 pills.

*Pilulæ Aloës et Asafœtidæ* (U. S. P.).—Pills of Aloes and Asafetida (of each, gr. 1⅓). *Dose,* 1–4 pills.

*Pilulæ Galbani Compositæ.*—Compound Pills of Galbanum (asafetida, gr. ss). *Dose,* 1–4 pills.

*Emplastrum Asafœtidæ.*—Asafetida Plaster (35 per cent.).

**Pharmacology.**—Asafetida is a gum-resin obtained from the root of Ferula fœtida (Umbelliferæ), usually obtained by incision from the living root. This plant is a native of Persia and neighboring countries. The United States Dispensatory says that the source of the asafetida of commerce must still be considered doubtful; it usually is brought to this country from India. The drug occurs as rough, irregular, rather soft masses, of brown color, somewhat garlicky odor, and acrid to the taste. The odor depends upon a volatile oil, which appears to be allyl persulphide. The agent also contains ferulaic acid, resin-gum bassorin, with traces of acid calcium malate (Pelletier).

**Physiological Action.**—The effects are moderately stimulating, antispasmodic, and expectorant. Large doses cause vomiting and diarrhœa, especially in persons unaccustomed to its effects. In medicinal doses it is carminative, and increases the quantity of the gastric juice. The sexual functions are said to be stimulated, and a general feeling of warmth is diffused through the body. Asafetida increases the action of the heart and arterial pressure, stimulates the functions of the skin and kidneys, and is a mild cerebral excitant. It is eliminated by the lungs, bowels, skin and kidneys.

**Therapy.**—Asafetida is not used locally (although the plaster was formerly official), since, to those unaccustomed to its use, the odor is very offensive. This, however, makes it additionally useful in treating some nervous disorders, such as hysteria. Goodell advises that a teaspoonful of the tincture be mixed with hot water under a hysterical patient's nose, and used either by the stomach or per enema. In nervousness of children, the pills are serviceable, and in colic or convulsions the mixture or milk of asafetida may be used freely as an injection. The mixture of magnesia and asafetida is used as an antacid and carminative for infants with colic, but the opium in it must not be overlooked. The pil. galbani comp. are used for flatulence and intestinal indigestion in elderly people. The combination with aloes is theoretically useful in amenorrhœa, but, practically, it is just in these cases that asafetida cannot be used, on account of its odor and taste. Italian physicians recommend the systematic administration of asafetida during pregnancy when there is a history of previous abortions or when abortion is immediately threatened. It is given in doses gradually ascending from 3 to 15 grains a day, after which the amount is, in the same manner, reduced. Its use is not advocated, however, in cases dependent upon syphilis, tuberculosis or disease of the uterus and its appendages. The favorable influence of asafetida in these cases has been confirmed by Warman, who found that the drug reduced hæmorrhage, had a tranquillizing effect and was particularly useful in cases of habitual abortion. Small doses of asafetida are valuable in the later stages of bronchitis, especially that of old people. Its combination of expectorant and carminative virtues likewise renders it of service in emphysema. It may often be advantageously employed in spasmodic asthma, especially used as follows:—

℞ Mist. asafœtidæ, . . . . . . . . . f℥j.
Elix. ammon. valeriatis,
Elix. humuli, . . . . . . . . . āā f℥iss.
M. Sig.: A teaspoonful or two in water every hour or two.

As an antispasmodic and expectorant asafetida has been employed in whooping-cough. It may also be given with advantage in chorea, especially when that affection occurs in weakly girls about the period of puberty and associated with menstrual difficulty. In the flatulence and constipation of hypochondriasis it is a good remedy, and is especially appropriate on account of its undoubted exhilarant effect upon the brain. The mixture of asafetida injected into the rectum is efficient in promoting the expulsion of flatus, and may be resorted to in the tympanites of typhoid fever. It can be prescribed thus:

℞ Tinct. asafœtidæ, . . . . . . . . . f℥j.
Tinct. cardamon. co., . . . . . . . . fʒj.
Spt. ammon. arom., . . . . . . . . fʒj.
Aquæ menth. pip., . . . . . . . . . f℥ij.
M. Sig.: One to two teaspoonfuls in water every two or three hours.

## ASCLEPIAS (U. S. P.).—Pleurisy-Root.

### *Preparations.*

*Extractum Asclepiadis Fluidum* (U. S. P.).—Fluid extract of Asclepias. *Dose,* ♏xv–fʒj.
*Infusum Asclepiadis.—Dose,* f℥i–ij.
*Tinctura Asclepiadis.—Dose,* fʒss–j.
*Asclepidin.—Dose,* gr. i–v.

**Pharmacology.**—The root of Asclepias tuberosa (Asclepiadeæ) contains resins and fatty matter. **Asclepidin** appears to be impure resin, precipitated from alcohol.

**Physiological Action.**—The infusion is used in the South as a diaphoretic and expectorant; in large quantities it is emetic and cathartic. It depresses the heart's action and increases that of the skin and kidneys.

**Therapy.**—The recent infusion (1 ounce to the pint; dose, a wineglassful) is used in domestic practice for colds and pulmonary affections of an inflammatory and catarrhal character. In diarrhœa, dysentery, and painful disorders of the stomach or bowels, it is often effective, a very good prescription being:—

| | |
|---|---|
| ℞ Tinct. asclepiadis, | f℥ij. |
| Spt. vini gallici, | f℥j. |
| Syrup. rubi idæi, | f℥iij. |

M. Sig.: A tea- to a table-spoonful every hour or two, for diarrhœa and dysentery.

As a diaphoretic, it is used in the exanthemata, in order to facilitate the eruption and reduce the fever, and it is said to be advantageous in articular rheumatism, in controlling the inflammation and reducing the heart's action.

A decoction made from the root-bark of Asclepias syriaca possesses diuretic properties and has been found useful by Dr. G. D. McGauran in the relief of renal dropsy. In œdema of cardiac origin it appears to be of no avail. A tincture of the root of Asclepias verticillata has a popular reputation in the South as an antidote to the bites of venomous serpents and insects as well as in hydrophobia. Twelve ounces of a saturated decoction are said to relieve pain, produce perspiration and promote sleep.

### ASEPTOL.—Sozolic Acid.

**Pharmacology and Therapy.**—A syrupy, dark liquid, freely soluble in alcohol, water, and glycerin. It contains orthophenol-sulphonic acid (33⅓ per cent.) diluted with water, and resembles carbolic acid in odor, though fainter. It is less caustic, but is decidedly antiseptic, and is said not to be toxic. When used, it is to be diluted (1 to 20 of water) for surgical practice.

### ASPARAGUS.—Asparagus.

*Preparation.*

*Asparagin.—Dose*, gr. i–ij.

**Pharmacology and Physiological Action.**—The root of Asparagus officinalis (Liliaceæ), when fresh, is used in decoction or infusion (℥i–ij to Oj) as a diuretic, laxative, and blood-purifier. The fresh shoots are used as food, and increase the flow of urine, while imparting to it a peculiar, heavy odor; in some cases it has apparently caused congestion of the kidneys, with hæmaturia. **Asparagin**, which is obtained principally from the root, has a sedative action upon the circulation, reducing the force and frequency of the heart's action, and causing frontal headache. The peculiar odor emitted by urine passed after the ingestion of asparagus depends, in all probability, according to Professor Nencki, upon the presence of methyl-mercaptan. This substance is thought to be produced in the albuminous disintegration which accompanies the germination of the plant.

**Therapy.**—Asparagus was believed by the ancients to have valuable aphrodisiac properties, and was used as an emmenagogue; the writer confirms the observation of Ehrhardt, that a discharge resembling that of gonorrhœa or urethritis may be caused by eating asparagus. Asparagus is usually considered harmful in gonorrhœa. Though it increases or even excites scalding, yet its action appears to be very uncertain. Berkely Hill,* in a series of twenty cases, allowed one-half the number to eat asparagus and found that some could partake of it with impunity, while in others it produced increased congestion and flow of discharge.

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* Chronic Urethritis and Its Treatment, London, 1890.

It has been claimed that asparagus has special effects upon the uterus as an oxytocic after miscarriage, or in labor. A tincture (℥v of the dried tops to Oij proof-spirits) is used as a diuretic, in doses of ʒss–j, by Dr. Jefferson, of England. A better preparation would result from crushing and straining five pounds of the fresh tops and evaporating the juice to one pint, to which an equal quantity of rectified spirits should be added, the dose being the same. Asparagin in doses of two or three grains may be used as a diuretic in dropsy, and according to Whitla, appears to act in gout like weak doses of colchicum. It is also of some service in cardiac dropsy, chronic rheumatism, and gout. The combination of asparagin with one of the bromides for the latter affections in this prescription is often of value:—

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|---|---|
| ℞ Asparagin, . . . . . . . . . . | gr. xvj. |
| Sodii bromidi, . . . . . . . . . | ʒv. |
| Syrup. aurantii, . . . . . . . . . | f℥iv. |

M. Sig.: Two teaspoonfuls in water three or four times a day.

The ingestion of asparagus is capable of causing, in some individuals, a disturbance of the functions of the kidney and a notable decrease in the amount of urine excreted.

**ASPIDIUM** (U. S. P.).—**Aspidium (Male Fern).**
**Dose** (in powder), ʒss–ʒiss.

### *Preparation.*

*Oleoresina Aspidii* (U. S. P.).—Oleoresin of Aspidium. *Dose*, fʒss–ij.

**Pharmacology.**—Aspidium is the rhizome of the Dryopteris Filix-mas and of Dryopteris marginalis (Filices), plants found in almost every portion of the world, especially the former, the latter being indigenous to North America. The rhizome, the portion employed, which deteriorates by being retained for a long time, has a sweetish-bitter, astringent taste, with some slight odor. It contains an active principle, filicic acid, a fixed and volatile oil, resin, tannic and gallic acids. Its virtues are due to the ethereal extract, or oleoresin. The oleoresin of male fern is a dark, thick fluid, of a bitter and nauseous taste. According to Professor Kobert its virtues do not depend entirely upon the filicic acid present, but also upon the ethereal oil. From his chemical and physiological investigations E. Poulsson concludes that the crystalline substance heretofore known as filicic acid is really the anhydride of the acid, and he proposes to call it filicin. True filicic acid precipitates from an alkaline solution as an amorphous white powder without taste or smell, insoluble in water, soluble in boiling alcohol, and it is this substance which Poulsson regards as the poisonous and vermifuge constituent of oleoresin of male fern.

**Physiological Action and Therapy.**—Male fern possesses the power of expelling and perhaps destroying tænia. Harley believes that it is only able to detach the entozoon from the intestinal wall. It is especially active against the bothriocephalus latus.

Large doses of the ethereal extract, or oleoresin, may occasion nausea, vomiting, and choleraic diarrhœa, followed by death from the congestion and inflammation of the gastro-intestinal tract by the irritant action of the drug. In the *Wiener klinische Wochenschrift* is reported the case of a child 5½ years old, to whom 2 drachms of the oleoresin were given in three doses within one hundred minutes. In an hour and a half part of the tape-worm was expelled, then vomiting occurred, and somnolence, followed by twitching, sopor, and trismus of ten minutes' duration, ending in death five hours after the last dose of the extract.

A post-mortem examination of a case of poisoning and death from male fern revealed congestion and ecchymoses of the stomach and blood-clots over its surface. Poisoning from male fern should be treated by the administration of castor-oil and the hypodermic injection of spirit of ammonia in from 10 to 30 minims, properly diluted. According to Prevost and Binet, death usually results from paralysis of the heart, which is found after death firmly contracted and unresponsive to irritation. Male fern generally reduces the amount of urine secreted.

**Therapy.**—Male fern is an efficient tæniacide. The ethereal extract, or oleoresin, is the most acceptable preparation, but, being a thick, bitter, nauseous substance, it is best given in capsules. It can be given, but not so well, in milk or mucilage. The dose (ʒss to ʒij) should be preceded and followed by a purgative. Trousseau and Pidoux advise the restriction of food to a milk diet for a day or two previous to the treatment being undertaken. Whitla has found that male fern is efficient among children in a reduced dose when combined with turpentine.

This combination of male fern often acts well, especially if a restricted diet precede the use of the preparation, and if it be followed by a good purgative, castor-oil being one of the very best to employ:—

| | | |
|---|---|---|
| ℞ | Oleoresinæ aspidii, | ʒss. |
| | Ol. peponis expressi, | f℥ss. |
| | Ol. terebinthinæ, | ♏xxx. |

M. Sig.: Take at a dose after fasting, and follow by a purgative.

Lanara claims good results from the application of male fern in eczema. The formula which he employs is as follows:—

| | | | |
|---|---|---|---|
| ℞ | Extr. aspidii alcoholic., | | ʒvijss. |
| | Sp. vini rect., | | f℥ss. |
| | Ext. myrrh, | | |
| | Extr. opii, | āā | ʒj. |

In several cases of cysticercus disease, Dr. R. Feletti has observed improvement follow the use of ethereal extract of male fern. The result was especially favorable when the lesions were situated in the subcutaneous or muscular tissues.

### ASPIDOSPERMA.—Quebracho.

*Preparation.*

*Extractum Aspidospermatis Fluidum* (U. S. P.).—Fluid Extract of Aspidosperma. *Dose*, fʒss–ʒj.

**Pharmacology.**—The bark of the Aspidosperma Quebracho blanco (Apocynaceæ), a large tree of Brazil, contains two alkaloids, **Aspidospermine** and **Quebrachine**, and other principles not yet studied.

The substance known as aspidospermine occurs in the form of colorless crystals, insoluble in water, moderately soluble in alcohol and ether.

According to Dr. G. Bordet, the aspidospermine of commerce is a mixture of several products derived from quebracho bark.

Heine states that three other alkaloids are also present, viz., aspidospermatine, aspidosamine and hypoquebrachine.

It has also been obtained in Catamarea, of the Argentine Republic, where it has a popular reputation as a febrifuge and antiperiodic. A fluid extract is the best preparation.

**Physiological Action.**—Quebracho is bitter and stimulant to the salivary glands, astringent to the intestinal tract. In large doses in animals it produces paralysis of the limbs, of central origin.* It also causes salivation, paralysis of respiration, and diminished frequency of the heart's action; death is caused by paralysis and convulsions due to apnœa. Moderate doses retard breathing, and make inspiration slower and fuller. Aspidospermine is said to reduce febrile temperature. Aspidospermine increases the respiratory movements, retards the action of the heart and reduces temperature.

**Therapy.**—The special action upon the motor apparatus of respiration makes quebracho valuable in treating dyspnœa of all kinds, whether bronchial, cardiac, or nervous. In emphysema, with or without asthma, it has been very serviceable in the form of fluid extract, ♏xx–xl, several times a day. Quebracho is also of service in spasmodic croup. Dr. Picot states that it is advantageous to the respiration when taken before hill-climbing. The effect of quebracho in relieving cyanosis is very marked. In the case of a child suffering from double pneumonia, Dr. Lawrence witnessed decided improvement of the respiration and circulation follow the use of this remedy. This drug very sensibly diminishes the pulse and temperature in acute rheumatism and inflammations of serous membranes. An elixir, a wine (6 per cent.), and a tincture (40 to 50 per cent.) have also been used. The alkaloid aspidospermine has been employed as a febrifuge, and, according to Guttmann, its dose as an antiperiodic is 18 grains, the ordinary dose being 1 or 2 grains. It is soluble in oils or 50 parts of pure alcohol. Bardet has given aspidospermine in dyspnœa with good results. In serious cases the drug can be well administered by hypodermic injection. Quebrachine hydrochlorate has been given both by the mouth and hypodermic injection for the relief of dyspnœa, the dose employed being from 1 to 2 grains.

**ATROPINA.—Atropine.**

**ATROPINÆ SULPHAS.—Sulphate of Atropine.** See Belladonna.

**AURANTIUM.—Orange.**

*Preparations.*

*Aurantii Dulcis Cortex* (U. S. P.).—Sweet Orange-Peel. The rind of the fruit of Citrus aurantium (Aurantiaceæ).

*Aurantii Amari Cortex* (U. S. P.).—Bitter Orange-Peel. The rind of the fruit of Citrus vulgaris.

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* F. Penzoldt, *Berliner klin. Wochenschrift*, No. 19, 1879.

*Aurantii Flores.*—Orange Flowers. The partly expanded fresh flowers of Citrus aurantium and Citrus vulgaris (Aurantiaceæ).

*Oleum Aurantii Florum* (U. S. P.).—Oil of Orange Flowers (Oil of Neroli).

*Oleum Aurantii Corticis* (U. S. P.).—Oil of Orange-Peel.

*Extractum Aurantii Amari Fluidum* (U. S. P.).—Fluid Extract of Bitter Orange-Peel.

*Tinctura Aurantii Amari* (U. S. P.).—Tincture of Bitter Orange-Peel (20 per cent).

*Aqua Aurantii Florum* (U. S. P.).—Orange-Flower Water.

*Aqua Aurantii Florum Fortior* (U. S. P.).—Stronger Orange-Flower Water.

*Syrupus Aurantii Florum* (U. S. P.).—Syrup of Orange-Flowers.

*Elixir Aurantii.*—Elixir of Orange. Simple elixir.

*Syrupus Aurantii* (U. S. P.).—Syrup of Orange.

*Tinctura Aurantii Dulcis* (U. S. P.).—Tincture of Sweet-Orange Peel (20 per cent.).

*Spiritus Aurantii* (U. S. P.).—Spirit of Orange (oil of orange-peel, 6 parts ; alcohol, 94 parts).

The dried peel of bitter orange enters into compound tinctures of cinchona and gentian.

The bitter orange, Citrus vulgaris, and the sweet orange, Citrus aurantium (Aurantiaceæ) are the fruit of small trees which grow in warm regions of the Eastern and Western Hemispheres.

**Pharmacology and Therapy.**—Orange-juice, with water and sugar, may be used as a drink for fevers, and as an antiscorbutic. Care should be taken, after typhoid fever, not to allow children to suck the juice from the orange, as death has been caused by the passage of a seed through an ulcerated patch in the intestine. Death has also been caused by a child eating the fresh rind, which contains the volatile oil. Erythema, œdema, vesicles and pustules may be occasioned by paring bitter oranges. The elixir is an agreeable vehicle for other remedies, having the alcoholic strength of a cordial. The other preparations are pleasant flavoring agents.

**AURI ET SODII CHLORIDUM.** (U. S. P.).—**Gold and Sodium Chloride.**

**Dose,** gr. $\frac{1}{50}$–$\frac{1}{10}$.

**Pharmacology.**—On account of its position among metals, gold has been believed to have some special medicinal value, although not a normal constituent of the human body. It is practically non-corrosive, and, before the era of antiseptic surgery, it was used to some extent to protect instruments from rusting. In a pure state gold is too soft for most purposes, although it is the best material for wire and for filling teeth. The only preparation official is the chloride, which is combined with an equal quantity of chloride of sodium, corresponding with 32.4 of metallic gold. This forms an orange-colored powder, slightly deliquescent in the presence of dampness, freely soluble in water. It is best dispensed as a tablet triturate. Lainer has recently prepared a gold and potassium chloride by dissolving pure gold in aqua regia by the aid of heat and adding a concentrated solution of potassium chloride. The compound is stable and neither acid nor deliquescent, but no clinical reports of its use have yet been made.

**Physiological Action.**—The effects of the gold chloride are very much like those of the mercuric chloride. In concentrated form it has an escharotic action upon the skin. Internally, in very small doses, it acts upon the glandular structures of the stomach and liver; it stimulates nutrition and assimilation; but, in larger doses, it reduces the oxidizing power of the red blood-cells. In large doses it excites salivation, but does not affect the teeth, cheeks or gums. This salt exercises a constipating effect upon the bowels. Upon the brain and spinal cord its effects are those of a tonic. In some instances it produces decided mental exhilaration. When its use has been too long continued it gives rise to what has been termed "auric fever," a condition characterized by profuse sweats and an increase of saliva and urine. Large doses may cause gastro-enteritis, vomiting, etc., similar to corrosive chloride of mercury, and the antidote is albumin and demulcents. The remedy acts upon the kidneys, increasing the urinary flow, and the secretion, after large doses, is colored yellow. It is claimed that gold has aphrodisiac powers, causing painful erections in men and increasing the menstrual flow in women. Gold is removed from the body chiefly by the kidneys, but to some extent also by the liver and bowels.

**Therapy.**—From the physiological action upon the glandular system of the stomach and liver, and the resulting improvement in the powers of assimilation, gold may be especially valuable in atonic dyspepsia, enabling the patient to digest more food. It is of decided service in nervous dyspepsia. Also, in gastric catarrh, chronic inadequacy of the hepatic functions (torpid liver), and early stage of cirrhosis, the gold and sodium chloride is a useful remedy. Administered in this prescription, it often is most effective in gastric catarrh and torpid liver:

| | |
|---|---|
| ℞ Auri et sodii chloridi, | gr. ss. |
| Ext. nucis vomicæ, | gr. iij. |
| Ext. taraxaci, | ʒj. |

M. Ft. pil. no. xxx.
Sig.: Two pills three times a day.

In cirrhosis of the kidney, also, it is believed to have a special place. Following out the physiological action, we find that, in spinal sclerosis, premature senility, in depression and hypochondria, it has a high degree of efficiency. This salt is beneficial in the vertigo of the aged dependent upon atheromatous vessels, and also in vertigo due to indigestion. It is useful in hysteria and functional impotence. In spasmodic affections (whooping-cough, laryngismus stridulus) it has some advocates. Where amenorrhœa or dysmenorrhœa is due to deficient innervation, and not to local lesion or obstruction, this remedy has given good results, and also in habitual abortion. Uncomplicated chronic ovaritis is benefited by the administration of gold. The double salt is also beneficial in ovarian neuralgia. This remedy has been given with advantage in neurasthenia, progressive general paralysis, utero-ovarian congestion, menorrhagia, subacute metritis, nymphomania, and spermatorrhœa. Dr. John Strahan, of Belfast, suggests that it may be useful in insomnia dependent upon cerebral anæmia. In the treatment of impotence Professor Glenn, of the University of Tennessee, has found the following combination of service:—

℞ Auri et sodii chlorid., . . . . . . . . . gr. iij.
Strychnin sulphat., . . . . . . . . . . gr. j.
Zinci phosphat., . . . . . . . . . . . gr. iij.
Extr. damianæ, . . . . . . . . . . . ʒj.
M. et ft. in capsulas no. xxx.
Sig.: One capsule thrice daily.

It is probably true that the gold chloride is, in some cases, an efficient substitute for mercuric chloride in the treatment of syphilis, especially of the primary and secondary stages, and it has been tried in this combination, where there was an undue susceptibility to mercury, with decided benefit:—

℞ Auri et sodii chloridi, . . . . . . . . . gr. j.
Ext. sanguinariæ, . . . . . . . . . . gr. ij.
Ext. calumbæ, . . . . . . . . . . . gr. xxx.
M. Ft. pil. no. xxx.
Sig.: One pill three times a day.

Gold also proves of avail in the late manifestations of syphilis, and is sometimes effectual, after failure of the mixed treatment by means of mercury and iodine. It has been of service in ulcerations of the throat, ozæna, diseases of the bones, and syphilitic phthisis. Dr. J. A. Robinson reports two cases of diabetes mellitus in which gold and sodium chloride caused a steady decrease and final disappearance of glycosuria. In hypochondria and melancholia the double salt is highly recommended. Gold bromide has been used in epilepsy, with advantage, by Dr. Goubert, who administers it to adults in the daily dose of $\frac{1}{10}$ to $\frac{1}{6}$ grain, and from $\frac{1}{25}$ to $\frac{1}{10}$ grain to children. The remedy is given in solution. The same writer has found it beneficial in migraine, chorea, and exophthalmic goitre. The bromide has been of use in hysteria, hystero-epilepsy, cerebral anæmia, and in syphilis. In one case of pyelitis Dr. G. Frank Lydston, of Chicago, found the hypodermic injection of gold and sodium chloride produce decided improvement. Gold chloride has been found useful in the treatment of chronic tobacco poisoning and morphine addiction.

From the results of fifty-two experiments made upon various species of warm-blooded animals Calmette concludes that the subcutaneous injection of gold is antidotal to the poison of the cobra di capello. He believes that the venom may be neutralized even after it has been absorbed and that the treatment may be successfully applied to human beings. His method is to cast an elastic ligature around the limb, to inject 8 to 10 cubic centimetres (2 to 2½ drachms) of a 1-per-cent. solution of gold chloride into the wound and beneath the surrounding skin, not more than 1 cubic centimetre being deposited at any one spot. Injections are also made at the level of the ligature as well as between it and the heart. The solution may be thrown either into the connective or muscular tissue. As soon as the injections have been made the ligatures may be removed. The method merits trial in the case of bites from other venomous serpents, since, as Weir Mitchell has shown, the poisons are substantially of the same chemical composition.

Gold cyanide, a yellowish, crystalline, tasteless powder, insoluble in water, alcohol, and ether, has been used by Oesterlen in scrofula, phthisis, and amenorrhœa. The dose is $\frac{1}{50}$ to $\frac{1}{10}$ grain.

Gold chloride enters into the treatment of tuberculosis by the Shurley-Gibbes method, and Dr. Joseph Drzewiecki reports the cure of a case of lupus by the internal administration of the same salt in the dose of $\frac{1}{150}$ grain three times a day.

Combinations of gold bromide with some other metals have, with some difficulty, been prepared in accordance with the suggestion of Dr. W. F. Barclay, of Pittsburg. The solution of gold and arsenic tribromide is of a beautiful red color, almost tasteless, is well borne by the stomach and has no constipating effect. Ten drops of the solution are equivalent to $\frac{1}{32}$ grain of gold tribromide and $\frac{1}{16}$ grain arsenic tribromide. The remedy should be administered well diluted with water. It has been beneficially used in headache, epilepsy, exophthalmic goitre, hystero-mania, arthritis deformans, syphilitic dactylitis and nodes, cirrhosis of the liver, interstitial nephritis, fibroid phthisis, strumous adenitis, and chronic eczema. A solution of gold and mercuric bromide has also been made and is a red and transparent fluid, ten drops of which contain $\frac{1}{32}$ grain each of gold and mercuric bromide. The late Dr. E. A. Wood, of Pittsburg, has administered this combination with evident advantage in iritis. Dr. Thomas Hunt Stucky has derived advantage from its employment in hemiplegia, ataxia and chorea. Gold is contraindicated when cerebral hyperæmia or intra-cranial pressure exists.

**AVENA.—Oat.**

**Pharmacology and Therapy.**—The fruit of Avena sativa (Gramineæ) is used as a food in the form of meal, of which cakes, gruel, or porridge is made. It is a highly nutritious food, containing oil, nitrogenized principles, carbohydrates, phosphates, etc., but on account of its concentrated form and the presence of irritating fragments of the outer coat, containing silica, oatmeal is likely to cause indigestion, and in young children diarrhœa. The habit of eating porridge with milk and large quantities of sugar is apt to cause sour stomach and pyrosis, which may be avoided by using butter or cream and salt instead of the milk and sugar. Skin eruptions have been attributed to the use of oatmeal, particularly eczema, in infants, which is cured by a change of diet. An alcoholic tincture of oats has been supposed to have a sedative action upon the cerebral centres and to remove the craving for drink. For the latter, it would be more rational to recommend an infusion than a tincture.

**AZEDARACH.—Azedarach.** (Pride of China.)

**Pharmacology and Therapy.**—The bark of the root of Melia azedarach (Meliaceæ) is used in our Southern States in the form of a decoction (℥iv to Oij, boiled down to Oj), as a vermifuge, in cases of round worm, ½ ounce being given to a child every two or three hours until the bowels are freely moved. Large doses may cause vertigo, dilated pupils, and stupor. A fluid extract has been also used (dose ʒj), but the fresh decoction is the best preparation.

**BALSAMUM CANADENSE.—Canada Turpentine.**

**Dose,** ♏v–x, preferably in capsules.

**Pharmacology.**—The fir, Abies balsamea (Coniferæ), is indigenous to the northern part of the United States and Canada. The balsam, or oleoresin, is obtained by collecting the juice, which naturally exudes upon the tree, and through spontaneous evaporation. It is a viscid, nearly transparent, yellowish liquid, of rather pleasant odor and bitterish taste, completely soluble in ether, chloroform or benzol. The balsam is said to contain about 20 per cent. of volatile oil. When dried it is a clear mass, entirely without structure; so that it is useful in microscopic work.

**Physiological Action and Therapy.**—In their actions upon the human body, the various forms of turpentine resemble each other so closely as not to require separate treatment. It is probable that the good effects obtained by Mr. Clay and Paracelsus, in the treatment of uterine disease with Chian turpentine, might be obtained from our native turpentine. It may be administered in capsule or emulsion, and may also be applied locally. As a surgical dressing it also is useful, owing to its adhesive and antiseptic qualities, resembling, in this respect, the balsam of Peru.

### **BALSAMUM PERUVIANUM** (U. S. P.).—**Balsam of Peru.**

**Dose,** ♏x–xxx.

**Pharmacology.**—A balsam obtained from Toluifera pereiræ (Leguminosæ), a tree in Central America. It is a honey-like liquid, of fragrant odor and a warm, rather acid taste, containing resin, volatile oil, and both benzoic and cinnamic acids. It is inflammable, burning with a white smoke and fragrant odor. It is entirely soluble in 5 parts of alcohol, and should not diminish in volume when agitated with an equal bulk of benzin or water. Stockman states that after taking Peruvian balsam the urine gives with nitric acid a precipitate which resembles that due to albumin. The former is, however, soluble in alcohol.

**Physiological Action and Therapy.**—Peruvian balsam is carminative, stimulant, and expectorant, and has been extolled in Europe by Landerer and Schnitzler, in phthisis pulmonalis and chronic bronchial catarrh, given in capsules or emulsion, and also used in an inhaler. Professor Landerer has convinced himself that the virtue of balsam of Peru in tuberculosis depends upon the presence of cinnamic acid, which he has of late employed in place of the balsam. The cinnamic acid of which he makes use is obtained from storax. It is colorless, crystalline, feebly soluble in cold water, freely soluble in hot water, alcohol and warm oil. A 5-per-cent. emulsion of the acid is prepared with almond oil, yelk of egg and common salt in solution. Before use the emulsion must be rendered alkaline by mixing with a 25-per-cent. solution of liquor potassæ. The emulsion is preferably thrown into a vein. The method is not applicable to the later stages of pulmonary tuberculosis. From 2 to 6 drops of the emulsion are injected twice a week. Of fifty cases thus treated Landerer reports ten deaths, ten cases of improvement and twenty-nine cures, one case remaining uninfluenced. Improvement is said to begin in the third week. The treatment is believed to produce encapsulation and absorption of tuberculous deposits. In lupus he employs an alcoholic solution of 1 part of cinnamic acid, 1 part of cocaine hydrochlorate and 20 parts of alcohol, one or two drops being injected into the nodules till 10 drops have been used at one *séance.* At the end of a week the procedure is repeated. As it is a deodorant and antiseptic, it is useful as a local application in recent wounds, compound fractures, and also in the treatment of ozæna, old ulcers, and in uterine affections:—

| | |
|---|---|
| ℞ Iodoformi, | ʒiv. |
| Balsami Peruviani, | ℥ij. |
| Lanolini, | ʒij. |

M. Sig.: For local application on absorbent cotton or carded wool.

In infantile eczema we may prescribe:—

| | |
|---|---|
| ℞ Acidi borici, | ʒss. |
| Balsami Peruviani, | gr. x. |
| Lanolini, | ℥j. |
| Ol. amygdalæ expressi, | q. s. ft. ung. |

M. Sig.: Apply frequently upon soft linen.

Balsam of Peru is sometimes an efficient application in pruritus of the vulva and senile paræsthesia. It is likewise efficacious in scabies. Leucoplakia, or local epithelial thickening of the mucous membrane, is removed by applications of Peruvian balsam; in leprosy it may be thoroughly rubbed into the affected areas. It is also a good local application for diphtheria. The internal use of Peruvian balsam has been recommended by Trousseau and Pidoux in chronic intestinal catarrh and typhoid fever. Nuggia has found it serviceable in the gastro-intestinal disorders of childhood. The external application of balsam of Peru has, in some instances, been followed by an erythematous, urticarial or eczematous eruption. Dr. Lohaus has reported a case of fatal gastritis in a six-days-old babe caused by balsam of Peru which had been applied to the mother's nipples on account of fissures.

**BALSAMUM TOLUTANUM.** (U. S. P.).—**Balsam of Tolu.**
**Dose,** gr. v–x.

*Preparations.*

*Tinctura Tolutana* (U. S. P.).—Tincture of Tolu (10 per cent.). *Dose,* ♏x–xxx.
*Syrupus Tolutanus* (U. S. P.).—Syrup of Tolu. *Dose,* f℥ss or more.
The compound tincture of benzoin contains tolu.

**Pharmacology and Therapy.**—A balsam obtained from Toluifera balsamum (Leguminosæ), a tree of New Grenada. It is a resinous exudation, containing a volatile oil, toluene, with cinnamic and benzoic acids and has an agreeable odor and taste.

Balsam of tolu is, when fresh, a thick, viscid fluid, but is, in time, converted into a hard, translucent solid. It is slightly antiseptic and expectorant; the syrup is a favorite basis for cough mixtures, chiefly on account of its pleasant taste. The balsam itself may be administered in emulsion with egg or mucilage. It should not be used during acute attacks of inflammation. The syrup covers the taste of chloral or croton-chloral (Brunton).

**BAPTISIA.—Wild Indigo.**

*Preparations.*

*Extractum Baptisiæ.*—Extract of Baptisia. *Dose,* gr. i–x.
*Baptisin.—Dose,* gr. i–v.

**Pharmacology and Therapy.**—The root of Baptisia tinctoria (Leguminosæ), indigenous to North America. **Baptisin,** an impure resin, is considered to have cholagogue properties (dose, gr. i–v), and has been found of service in amenorrhœa. The decoction or fluid extract may be used as a cathartic in large doses, or tonic astringent in small. In typhoid fever and bowel disorders, small doses of a tincture have been used, but not according to the best practice. The decoction may be employed as a douche in nasal catarrh, chronic ulcers, leucorrhœa, etc., or as a mouth-wash in stomatitis.

### BARII CHLORIDUM.—Barium Chloride.

**Dose,** gr. $\frac{1}{20}$–$\frac{1}{2}$.

**Pharmacology and Physiological Action.**—Barium, in its action upon the blood-vessels, resembles both ergot and digitalis. It causes the cardiac contractions to become more slow and forcible. Tonic spasm of involuntary muscular fibre is produced, peripheral blood-vessels are constricted, and blood-pressure rises. Peristalsis is likewise excited. Overdoses give rise to salivation, thirst, vomiting, purging, embarrassed breathing, slow pulse, dilated pupils, and paralysis of the extremities. In experiments upon animals Pilliet and Malbec found that barium chloride, injected subcutaneously in toxic doses, caused diarrhœa, albuminuria and hæmoglobinuria, and convulsions followed by rigidity. After death, lesions were found in most of the organs. The glomeruli of the kidneys were particularly affected, and hæmorrhages into the straight tubes were also observed. According to M. Bardet, barium chloride occasions coagulation of the blood, and death results mechanically from embolism. Death has occurred in consequence of $2\frac{1}{2}$ grains, the quantity not having been taken in one dose, but in daily portions of $\frac{1}{4}$ grain. The symptoms of intoxication manifested themselves at the end of a week. This, however, must be regarded as an exceptional case. The drug, in small medicinal doses, is devoid of active poisonous properties. Barium chloride is a white, crystalline substance, of a bitter and disagreeable taste, readily soluble in water. This salt is scarcely soluble in absolute alcohol, but dissolves in rectified spirit. The sulphates are incompatible with the salts of barium. In cases of poisoning the sodium, or magnesium sulphate, with white of egg, may be used as antidotes.

**Therapy.**—Barium chloride may be used as a cardiac tonic in valvular insufficiency with irregularity of the heart. Professor Da Costa finds that, in these conditions, it relieves pain and the sensation of uneasiness, acting as a fairly good diuretic and capable of being given for a considerable period without disturbing digestion. In minute doses, it is a stimulant and alterant, and may be used in scrofula.

From an administration of this salt to seventy-six children Lelli concludes that it is efficacious in the gastritis which accompanies the torpid form of scrofula, but that it is injurious in the florid form. In the beginning the remedy irritates the mucous membrane of the bowel and renders the process more acute, but the membrane is finally favorably modified. Barium has been recommended likewise in chlorosis and in cachectic conditions. In amenorrhœa it has been given with advantage. It has yielded good results in varicose veins and aneurism. It affords relief to the vascular phenomena of exophthalmic goitre.

Professor Kobert, of Dorpat, asserts that the local application of barium has a good effect upon dilated cutaneous veins. He advises the use of an ointment made by thoroughly mixing a solution of barium chloride with lanolin in the proportion of a drachm to the ounce. The ointment is applied with friction three times a day to the affected part. According to Dr. Lisle, the administration of $\frac{1}{8}$ to $\frac{1}{2}$ grain of this salt every four hours produces good results in epilepsy. Barium chloride is useful in atony of the bladder or intestine and in the treatment of hæmorrhage.

### **BELLADONNÆ FOLIA** (U. S. P.).—**Belladonna-Leaves.**

### **BELLADONNÆ RADIX** (U. S. P.).—**Belladonna-Root.**

*Preparations (from the leaves).*

*Extractum Belladonnæ Foliorum Alcoholicum* (U. S. P.).—Alcoholic Extract of Belladonna Leaves. *Dose*, gr. $\frac{1}{40}$–j.

*Tinctura Belladonnæ Foliorum* (U. S. P.).—Tincture of Belladonna Leaves (15 per cent.). *Dose*, ♏v–xx.

*Unguentum Belladonnæ* (U. S. P.).—Ointment of Belladonna (contains, of the alcoholic extract, 10 per cent.).

*Emplastrum Belladonnæ* (U. S. P.).—Belladonna Plaster.

*Preparations (from the root).*

*Extractum Belladonnæ Radicis Fluidum* (U. S. P.).—Fluid extract of Belladonna Root. *Dose*, ♏$\frac{1}{10}$-ij.

*Linimentum Belladonnæ* (U. S. P.).—Belladonna Liniment (contains, of fluid extract 95, camphor 5 parts).

*Active Principles.*

*Atropina* (U. S. P.).—Atropine. *Dose*, gr. $\frac{1}{200}$–$\frac{1}{60}$.

*Atropinæ Sulphas* (U. S. P.).—Atropine Sulphate. *Dose*, gr. $\frac{1}{200}$–$\frac{1}{60}$.

*Homatropine* (*oxytoluylic acid tropine*), *Homatropine Hydrobromate*, a salt of the preceding, is largely used by oculists as a mydriatic in weak solution. It is a derivative from tropine amygdalate by the action of hydrochloric acid.

*Benzoyl-tropine* is a combination of benzoic acid with tropine.

**Pharmacology.**—The leaves and the root of Atropa belladonna (Solanaceæ), or deadly night-shade, are each official, and provide pharmaceutical preparations. It is a native of Europe, and is cultivated here. All parts of the plant are active, but the fleshy, creeping root is especially so. The erect, purplish, branching stems stand about three feet high, and the leaves with short stalks are in pairs of unequal size, oval, entire; the flowers are large, bell-shaped, pendent, and of a dull-reddish color, the short peduncles arising from the axils of the leaves. The fruit, somewhat resembling a cherry, has two cells containing numerous seeds and a sweetish, violet-colored juice; it has an adherent calyx at the base. The large, cultivated leaves are said to have less of the active principle than the smaller leaves gathered while the plant is in flower. The roots are taken from plants at least three years old; those which are tough and woody, breaking with a splintering fracture, should be rejected. Belladonna contains atropine and hyoscyamine, duboisine, or daturine (Ladenburg), which differ in chemical or physical characters more than in their physiological effects.

**Physiological Action.**—Locally, belladonna affects the end organs of the sensory nerves and reduces painful sensibility, contracts the vessels, and checks the action of the sweat- and mammary-glands. It is readily absorbed through the unbroken skin, and symptoms of poisoning have appeared after its topical application. When applied to the eyes, belladonna widely dilates the pupil and relaxes the ciliary muscle, so as to temporarily paralyze the power of muscular accommodation of the eye. Applied to the throat, it produces dryness and choking sensations, and this is one of the first effects of its toxic action after it has been introduced into the system either by the mouth or by absorption.

Upon the brain it has an exhilarating effect, and a talkative delirium of mild form may appear. In some cases the delirium is of a violent type. Subsequently, sleep usually occurs. In the lower animals (frogs), atropine produces arrest of breathing, followed by convulsions. The transient flushing, or erythema, which appears after its use, is probably owing to its effects upon the sympathetic system as a stimulant. In some instances it produces a rash which closely resembles that of scarlet fever, and which may even be followed by desquamation. The influence of the drug upon the heart and circulation is believed to be indirect through the nervous system. Belladonna paralyzes the inhibitory filaments of the pneumogastric nerve, and as a result the heart, under the influence of the sympathetic plexus, runs at a rapid rate without being checked by the paralyzed pneumogastrics. The force of the heart's beat is also increased. Coincident with this, and as a result of its action upon the blood-vessels, arterial tension is increased. In toxic doses, however, blood-pressure is reduced. The contraction of the smaller vessels may be due to action upon the muscular fibres of the walls, or it may be secondary to the action upon the nervous system. Respiration becomes more rapid owing to stimulation of the respiratory centre. Contradictory statements have been made in regard to the effect of belladonna upon the respiratory centre. Dr. David Cerna, as a result of experimental and clinical study, coincides with the observation of Reichert, that "atropine acts upon the respiratory function in two opposing ways; one (peripheral) tending to diminish; the other (central) tending to increase; the increase or the decrease of the respirations in the normal animal depending upon which one of these factors predominates."

The flow of urine is increased as the result of increased arterial tension, but there is no increase in the solid constituents of the urine. The secretions generally are checked, notably those of the mouth and skin; the flow of milk is also arrested by it. Though intestinal secretion is at first diminished, it is, probably, subsequently increased, since the alvine evacuations become more frequent and more liquid during the administration of belladonna. In small doses it strengthens the muscular coat of the bowel. Belladonna is eliminated chiefly by the kidneys, but partly also by the bowels. It is said that atropine is, to a certain extent, destroyed by the liver.

**Toxic Effects and Antidotes.**—Poisonous symptoms occasionally appear as the result of the introduction of a very small quantity, either by absorption, as stated, or by passing from the eye into the nose, and thence into the throat. In such cases nothing more serious occurs than dryness of the throat, dilated pupils, possibly an erysipelatous or erythematous eruption upon the skin, and some fever and restlessness. Larger doses cause thirst, dryness, and aching of the fauces, flushing, rapid pulse, and hurried breathing, without decided increase of temperature, followed by coma or convulsions and death. The physiological antagonists which may be employed as antidotes are, morphine, physostigmine muscarine, and jaborandi, or pilocarpine. Chloral hydrate has also been used as an antidote, but this substance, as well as pilocarpine, is open to the objection of causing cardiac depression. According to Binz, morphine is particularly serviceable in allaying the restlessness and mental excitement caused by belladonna. Failing respiration is combated by strychnine. External heat will be useful if a state of collapse occurs. These agents should be cautiously administered, keeping within safe doses. Animal charcoal, fixed alkalies, and demulcents, followed by free evacuation of the stomach and bowels, may also be prescribed.

**Therapy.**—Belladonna ointment, or the liniment of belladonna, may be used with good results in neuralgia and chronic rheumatism; also, in local sweating. In the form of atropine it is used as a mydriatic, but strong solutions are liable to cause glaucoma. The solutions of atropine for ophthalmic practice, or for use hypodermically, should be freshly prepared each time, in order to avoid the development of penicillium in the liquid, which destroys the alkaloid, besides giving us an infected solution. M. Berger advocates the combination of alkaloids, believing that in this manner the same effects may be obtained by smaller doses. As a mydriatic he employs :—

| | |
|---|---|
| ℞ Atropin sulphat., | |
| Duboisin sulphat., | āā gr. ivss. |
| Cocain hydrobromat., | gr. xxx. |
| Aq. destillat., | f℥iij. |
| M. | |

In eye-practice belladonna is used to dilate the pupil and relax the accommodation in order to facilitate examination of the eye and determine its refraction, and also to prevent adhesions between the pupillary border of the iris and the lens, or to avoid protrusion of the iris through an ulcer of the cornea. According to the observation of Dr. George Carpenter, the instillation into the eyes of infants, though it may cause physiological symptoms, is unsatisfactory as regards its action upon the pupil, dilatation being generally very tardy and incomplete.

Some oculists consider atropine santonate as the best combination as a mydriatic, but atropine sulphate is the salt generally employed, in from ¼ grain to 4 grains to the ounce. The same solution is beneficially used in treating diseases of the ear, pain from inflammation of the middle or external ear, or membrana tympani, or earache being relieved by dropping it in warm when necessary.

Rigidity of the os uteri during labor may be relieved by the local application of belladonna ointment. The same preparation is useful in spasms of the neck of the bladder or of the sphincter ani, and in vaginismus. Rubbed upon the abdomen the extract of belladonna is said to check the vomiting of pregnancy and to relieve other reflex disorders dependent upon the gravid uterus. In leucorrhœa dependent upon inflammation of the cervix uteri, belladonna, in association with tannic acid, is a useful local application, allaying pain, if present, and restraining discharge.

It relieves the pain of herpes zoster, of irritable and malignant ulcers. It is serviceable in painful hæmorrhoids and fissure of the anus, checks the suppurative process in boils, and promotes the resolution of enlarged glands. For any local pain, the appended formula, known as Ludlow's, is very useful:—

| | |
|---|---|
| ℞ Atropinæ sulphatis, | gr. ss. |
| Aconitinæ, | gr. iss. |
| Olei tiglii, | gtt. ij. |
| Petrolati, | ʒ ij. |

M. Sig.: To be used by rubbing in a piece about the size of an ordinary pea.

This ointment may likewise be advantageously employed in the relief of inflamed joints. The following are good combinations:—

| | |
|---|---|
| ℞ Ungt. belladonnæ, | ʒ ss. |
| Lanolini, | ℥ ss. |
| Cerati plumbi subacetat., | ℥ iij. |
| Ungt. zinci oxidi, | ʒ ss. |

M. et ft. ungt.
Serviceable in furuncle, abscess, carbuncle, and herpes zoster.

| | |
|---|---|
| ℞ Cocainæ hydrochlorat., | gr. v. |
| Ungt. belladonnæ, | ℥ j. |

M. et ft. ungt.
A good application in ulcerated carcinoma or sarcoma, irritable ulcers, etc.

The pupils and throat should be carefully watched when belladonna ointment is used upon open surfaces. Accidents, probably due to idiosyncrasy, sometimes follow the use of atropine solutions in the eye. In addition to the more usual manifestation of belladonna poisoning, cellulitis of the eyelids and face and epistaxis have been observed. In some persons the use of perfectly neutral solutions of atropine proves markedly irritant to the conjunctiva and gives rise to what is known as "atropine conjunctivitis." It likewise acts as an irritant in certain cases of iritis, especially those occurring in rheumatic patients with posterior synechiæ. Its use requires great caution in glaucoma. In chronic cases it may excite an acute exacerbation. In inflammatory glaucoma it increases intra-ocular tension. Belladonna is an excellent local remedy in intercostal neuralgia or pleurodynia, and in the chest pains of phthisis. The liniment may be applied with friction, and is the more cleanly agent, but strapping the chest with belladonna plaster is generally more efficient in neuralgia. The plaster usually affords considerable relief in irritable heart. The same preparation is effective in lumbago and myalgia. It may be spread upon the abdomen in uterine or ovarian neuralgia, or in these affections the agent may be employed according to the method of Trousseau. This consists in combining 1 or 2 grains of the extract with 6 or 8 grains of tannic acid, and applying it to the cervix uteri upon absorbent cotton, or introducing it into the vagina in the form of a suppository. This combination is often valuable in leucorrhœa:—

| | | |
|---|---|---|
| ℞ Ext. belladonnæ folior. alc., | | gr. xxiv. |
| Acidi tannici, | | ʒ iss. |
| Olei theobromatis, | | q. s. |

M. et ft. suppositoria no. xxiv.
Three or four suppositories may be used daily.

A suppository containing the extract of belladonna, alone or in union with opium, is very valuable in dysmenorrhœa dependent upon spasm of the cervix uteri. Belladonna, locally applied, has the power of alleviating that perversion of sensibility known as paræsthesia or pruritus. Hence, a lotion or ointment containing this agent may be successfully used in pruritus of the genitals, urticaria, and chronic eczema, attended with excessive itching. A prescription like the following may be written:—

| | | |
|---|---|---|
| ℞ Naphthol., | | gr. xx. |
| Ungt. camphoræ, | | |
| Ungt. menthol., | āā | ʒ ij. |
| Ungt. belladonnæ, | | ℥ ss. |

M. et ft. ungt.

Or:—

| | | |
|---|---|---|
| ℞ Acid. carbolici, | | ʒ ss. |
| Linimenti belladonnæ, | | f℥ ij, |
| Glycerini, | | |
| Aq. rosæ, | āā | f℥ iv.—M. |

The liniment of belladonna, applied locally several times a day, has a remarkable power in restraining excessive sweating. A solution of atropine in equal parts of alcohol and chloroform, the strength being 5 grains of the alkaloid to the ounce of menstruum, will sometimes, according to Bartholow, allay obstinate cerebral or reflex vomiting.

Instead of belladonna, atropine may be used in proper quantity in forming ointments and lotions. The following is an elegant ointment for use in chronic ovarian, uterine, or pelvic disease:—

| | |
|---|---|
| ℞ Atropin. sulphatis, | gr. ij. |
| Ol. neroli, | ♏ vj. |
| Ungt. aquæ rosæ, | ℥ ss. |

M. et ft. ungt.

It has been asserted that atropine oleate made by dissolving 1 part of atropine in 30 parts of oleic acid and adding 50 parts of olive oil makes a suppository of far more uniform composition than when extract of belladonna is employed.

Belladonna is chiefly employed internally to alleviate pain, relax spasm, and check excessive secretion or morbid discharge. It is a valuable remedy in neuralgia, especially of the trifacial nerve, though other forms are frequently amenable to its influence. Anstie esteemed it superior to any other agent in neuralgia of the pelvic viscera. Belladonna is beneficially given by the mouth in dysmenorrhœa, especially if the disorder is due to spasm of the neck of the womb.

Atropine is often productive of the happiest results in gastralgia, enteralgia, and gastric ulcer. As neuralgia is often expressive of insufficient nutrition and is generally associated with anæmia, a combination of belladonna with iron, strychnine, and other tonic drugs is frequently successful. A formula similar to the following has been widely used:—

| | |
|---|---|
| ℞ Extr. belladonnæ, | gr. iij. |
| Quinin. sulphat., | gr. xviij. |
| Ferri sulphat. exsic., | gr. vj. |
| Strychnin. sulphat., | gr. ⅕. |
| Acid. arsenosi, | gr. ¼. |
| Oleoresinæ piperis, | ♏vj. |

M. et ft. pil. no. xij.
Sig.: A pill thrice daily.

For the relief of migraine, Trousseau was accustomed to administer ⅙ grain of the extract of belladonna every hour until the symptoms vanished or vertigo made its appearance. The tincture or fluid extract of belladonna, or atropine sulphate, is useful in relieving the spasm of laryngismus stridulus, hiccough, spasm of the œsophagus, or local convulsive manifestations of hysteria. Intestinal, hepatic, or renal colic is ameliorated by this remedy. Belladonna is likewise of service in lead colic. A combination of atropine and potassium iodide is recommended as possessing decided efficacy in the treatment of plumbism. Belladonna has also been successfully employed for the relief of strangulated hernia, ¼ grain of the extract being given hourly, spontaneous reduction occurring after administration of four to six doses.

Belladonna is of service in epilepsy, but needs to be given persistently in gradually increasing doses for a long period of time. It is particularly applicable to the *petit mal* or nocturnal epilepsy and to anæmic subjects. Belladonna is one of the most esteemed remedies for whooping-cough. It should be exhibited in sufficiently large doses to produce dilatation of the pupils, and is generally well borne by children in proportionately large doses. Belladonna is sometimes of signal service in spasmodic asthma. The most advantageous method of administration is that proposed by Dr. Salter, 10 minims of the tincture being repeated every two or three hours until disturbance of vision occurs or relief is obtained. The paroxysm may likewise be alleviated, though less certainly, by smoking belladonna-leaves in a pipe, or made into a cigarette. The tincture of belladonna is capable of affording marked benefit in exophthalmic goitre. When nocturnal incontinence of urine is caused by spasmodic contraction of the bladder, the fluid extract of belladonna is the best remedy which can be employed. The same treatment may be of avail in the incontinence of the aged. Atropine sulphate possesses considerable efficacy in spermatorrhœa and prostatorrhœa. It is best given at bed-time. Torticollis and muscular cramps are generally ameliorated by belladonna. Præcordial pain and overaction of the heart are relieved by the internal use of belladonna. This drug enters very serviceably into remedies for habitual constipation. In disease of the kidney it relieves congestion by its action on the arterioles. In typhoid and typhus fevers, Dr. John Harley has derived decided advantage from the use of belladonna, which cleans and moistens the tongue and quiets the brain. Inflammation of the pharynx and tonsils is lessened by the use of belladonna, which may, with great utility, be combined with aconite and given in a solution of potassium. chlorate. A suitable prescription may be thus formed:—

| | |
|---|---|
| ℞ Potass. chloratis, | ℈iv. |
| Acid. hydrochloric., dilut., | fʒiss. |
| Tr. aconiti, | ♏xvj. |
| Tr. belladonnæ, | fʒss. |
| Infus. rhus glabr., | q. s. ad f℥iv. |

M. et ft. sol.
Sig.: Tablespoonful every third hour.

On account of its beneficial influence upon the throat, belladonna has been used in scarlatinal angina. Much has been written concerning its value as a prophylactic in scarlatina, but in the experience of the author no reliance can be placed upon the drug as a preventive of that disease. It possesses some virtue as an internal remedy in erysipelas, and in this affection also is usefully given in conjunction with aconite, especially if much fever and delirium are present. It is sometimes able to check the vomiting of pregnancy. Aphonia due to fatigue of the cords soon disappears under the use of atropine. Belladonna is useful in allaying nervous cough, and, according to Bartholow and Fothergill, has an excellent effect in caseous pneumonia, provided it be given in the stage of deposit before softening has taken place. Small doses of belladonna or atropine three or four times a day check the profuse discharge of mercurial ptyalism. Professor H. Köbner, of Berlin, finds that the administration of belladonna facilitates the treatment of certain affections of the mouth, as leukoplakia, mucous patches, syphilitic ulcerations, etc., as it restrains salivation and the consequent rapid removal of the slough produced by the caustic. He usually gives the extract of belladonna dissolved in water, but atropine pills may be used with equal advantage.

The free sweating which occurs in weakly children after slight exertion or during sleep is suppressed by belladonna. The copious watery discharge of the first stage of acute coryza is controlled by atropine, which is one of the best remedies also in the night-sweats of phthisis, given at bed-time in the dose of gr. $\frac{1}{80}$–$\frac{1}{60}$. The free discharge of chronic bronchitis is restrained by belladonna. Colliquative diarrhœa is arrested by this remedy, according to M. Delpage. In certain cases of metrorrhagia, which had proved unamenable to other remedies, the hypodermic injection of the atropine sulphate in the dose of $\frac{1}{200}$ grain twice daily has been attended with complete success. Hæmoptysis has also been controlled in the same manner. Atropine is useful in ulcer of the stomach when accompanied by hyperacidity. The remedy is beneficial in hyperæmic and inflammatory conditions of the brain or cord. Liégeois and other writers warmly recommend the internal administration of belladonna in chronic urticaria. Atropine is a valuable agent for diminishing the effect of shock. It may be given, in the dose of gr. $\frac{1}{100}$–$\frac{1}{75}$, hypodermically, after a severe injury or prior to a surgical operation. Dr. Lauder Brunton suggests that the hypodermic injection of atropine may prove of service in the algid stage of cholera and cites the case of a child who recovered apparently as a result of this treatment.

Great caution should be observed in employing this method, for, as pointed out by Professor Manasseïn, with the revival of the circulation and absorbent capacity, toxic manifestations might very readily be produced. In many cases it is advisable to inject atropine into the affected tissues (parenchymatous administration). In deep-seated neuralgia of large trunks, as, for instance, in sciatica, the most rapid relief is obtained by this method. In sciatica and myalgia it is a good plan to combine a small quantity (gr. $\frac{1}{8}$) of morphine sulphate with the atropine solution for subcutaneous injection. The effect of each alkaloid is heightened by the combination. Stirling has found the hypodermic use of gr. $\frac{1}{150}$ of atropine valuable in a case of hæmorrhage from the lungs. In tic douloureux, likewise, atropine thrown under the skin is especially useful.

Moretti recommends the hypodermic injection of atropine in paralysis agitans. Ostermayer esteems the same procedure as a valuable sedative and indirect hypnotic in the treatment of insanity. Massey has obtained good results in angina pectoris from the subcutaneous injection of atropine combined with morphine. Leszinsky has reported the successful employment of hypodermic injections of atropine in a case of muscular torticollis, which was probably due to the influence of lead, as the patient was a painter. Various remedies, including electricity, had been used without effect. In torticollis excited by other causes the same procedure is of advantage. Some writers are of the opinion that belladonna retards the growth as well as lessens the pain of cancers and promotes the absorption of enlarged lymphatic glands. Atropine is serviceably employed as an antagonist to a number of powerful vegetable poisons, as opium, physostigma, agaricus muscarius, etc.

**BENZANILIDE.—Phenylbenzamide.**

**Dose,** gr. v–xv.

**Pharmacology.**—Benzanilide is a white powder, which melts at 321.8° F., is insoluble in water, soluble in alcohol and, with difficulty, in ether. In chemical composition it is closely allied to acetanilid. It is without odor and has a slightly caustic taste. It is given in single doses of 15 grains, and from 1 to 1½ drachms may be administered in the twenty-four hours. Though at first well borne in these amounts, intolerance is generally manifested after several days' use.

**Physiological Action.**—Benzanilide depresses febrile temperature. Its effects are manifested from half to one hour after exhibition; the maximum is reached in four or five hours; the temperature then begins to ascend, and reaches its original height in ten to twelve hours. Respiration is not usually affected, though occasionally it is hastened. The pulse is rendered more slow and soft. Benzanilide produces no alteration in the quantity or reaction of the urine, but communicates to that fluid a greenish or even blackish color. After having been used continuously for several days it gives rise to pallor of the face and cyanosis of the mucous membrane. Dr. Luigi Cantu, of Pavia, from his experience with this drug, states that it appears to have a cumulative effect.

**Therapy.**—The activity of benzanilide seems to be limited to the reduction of temperature, having no influence upon the course of the disease. It has been given in typhoid fever, rheumatism, pneumonia, in neuritis, sciatica, malaria, etc. Dr. Cantu did not perceive any good effects from its use in chorea, neuritis and sciatica. It exerted no favorable influence in malaria, either as regards the febrile paroxysms or the composition of the blood. It relieved the pain of acute rheumatism, but did not prevent extension of the disease to other joints.

**BENZINUM** (U. S. P.).—**Benzin.**

**Dose**, ♏x–xxx, in mucilage, or capsule.

**Pharmacology.**—A purified distillate from American petroleum, consisting of hydrocarbons, chiefly of the marsh-gas series, and having a specific gravity of from 6.70 to .675, and boiling at 50° to 60° C. (122° to 140° F.). Benzin, or petroleum ether, is a clear, colorless, diffusive liquid, yielding inflammable vapors, which, when mixed with air, are explosive; it, therefore, should be kept in a cool place, remote from lights or flame. It is soluble in alcohol, ether, and oils, but insoluble in water. Fats, resins, and caoutchouc are dissolved by it. It is used in pharmacy in making mustard leaves, extracting oleoresins, and other manipulations in which its solvent power is utilized.

**Physiological Action.**—Benzin resembles oil of turpentine in its local effects, especially when applied with friction. It is likewise an irritant when swallowed, but does not cause vomiting nor diarrhœa. It produces intoxication, faintness, headache, palpitation, or convulsions, which may end fatally; death may also be caused by gastro-enteritis, though relatively large amounts have been taken and the poisonous action overcome. The treatment should be directed toward evacuating the stomach and bowels, and counteracting the effects of the agent by diffusible stimulants and atropine, or ether, hypodermically.

**Therapy.**—Externally, benzin is used as a counter-irritant, applied upon a flannel bandage, or with friction, for neuralgic or rheumatic pains, but its odor is penetrating and unpleasant. Internally, it is not used in medicine, although it is a domestic remedy for lumbricoid worms and tænia. It is claimed to be a good parasiticide in itch and pediculosis. (See Petroleum.) Benzin has been employed with success in the treatment of trichinosis and is thought by Dr. Putter, from an experience with twenty-seven persons who had eaten trichinous pork, to possess prophylactic virtues against this species of poisoning. Benzin has been administered by inhalation with asserted advantage in whooping-cough.

**Gallacotophenon** is derived from benzin by the substitution of a methyl-ketone for a hydrogen atom. In an alkaline solution it oxidizes so slowly that alkaline salts can be prepared. It is a pale-yellow powder, crystallizing from aqueous solution in yellow needles, soluble in hot water, alcohol, ether and glycerin. Its solubility in cold water is promoted by the addition of sodium acetate. A 1-per-cent. mixture of gallacotophenon is destructive to the micro-organisms of suppuration. Experiments have been made in the clinic of Professor von Intz, of Berne, with a 10-per-cent. ointment in the treatment of psoriasis.

## **BENZOINUM** (U. S. P.).—**Benzoin.** (Gum Benjamin.)

*Preparations.*

*Adeps Benzoinatus* (U. S. P.).—Benzoinated Lard (2 per cent.).
*Acidum Benzoicum* (U. S. P.).—Benzoic Acid. *Dose*, gr. x–xxx.
*Tinctura Benzoini* (U. S. P.).—Tincture of Benzoin. *Dose*, fʒss.
*Tinctura Benzoini Composita* (U. S. P.).—Compound Tincture of Benzoin (benzoin 12, aloes 2, storax 8, tolu 4, alcohol q. s. ad 100 parts). *Dose*, fʒss–ij.
Ammonium, Lithium, and Sodium Benzoates are official.

**Pharmacology.**—Benzoin is a gum or balsamic resin obtained from Styrax benzoin (Styraceæ), a tree of the East Indies, containing an abundance of resinous fluid, which exudes from incisions made into the bark. The best quality is in light lumps or tears, but it also occurs in large masses. It contains, besides resin and a volatile oil, from 14 to 20 per cent. of benzoic acid, which may be extracted either by washing the resin with lime-water or by distillation. It should not contain cinnamic acid in appreciable quantity. Benzoic acid is in white, lustrous scales, or friable needles, permanent in air, having a slight, aromatic odor of benzoin, a warm, acid taste, and an acid reaction. It is soluble in 500 parts of water, 15 of boiling water, in 3 of alcohol, or 1 of boiling alcohol, in fixed oils and alkaline solutions. Benzoic acid melts at 250° F. It forms neutral salts with the alkalies.

It is volatilized by heat. Two other sources of the benzoic acid of commerce are known; it is a derivative of toluol and also of hippuric acid, the hippuric acid being derived from the urine of horses and cattle. The benzoic acid may retain some traces of its source, and, therefore, the pharmacopœia directs that it shall smell of benzoin. Benzoin prevents fat from becoming rancid, and hence it is, in small quantity, a useful addition to ointments.

**Physiological Action.**—In solution in the form of the tincture, benzoin is protective to excoriated surfaces, and, like other gums, is antiseptic. After absorption, it has a stimulating effect upon mucous membranes; part of it is decomposed in the system to form hippuric acid, and, being excreted by the kidneys, increases the acidity and the quantity of the urine. Benzoic acid has some power in preventing the growth of bacteria, possessing the advantage over carbolic acid of being non-poisonous. Sodium benzoate has a stimulating effect upon the liver, and, according to the experiments of Carl Virchow, increases nitrogenous elimination from the kidneys. Benzoic acid, or sodium benzoate, inhaled or taken internally, may, in exceptional instances, give rise to an erythematous or small papular eruption. In some cases of idiosyncrasy urticaria may be produced.

**Therapy.**—The tincture, especially the compound tincture, is used to paint over abrasions and excoriations in order to protect the surface, particularly in cases of tender nipples. It may also be painted on the skin for chilblains after bathing the surface with 5-per-cent. solution of carbolic acid. It was formerly employed as a dressing for ulcers. As an expectorant we may give tincture of benzoin in chronic bronchitis, and the official camphorated tincture of opium (paregoric elixir) contains some benzoic acid. In troublesome cough the combination with opium is necessary, although the opium checks secretion and expectoration; a better combination would be:—

| | | |
|---|---|---|
| ℞ Codeinæ, | | gr. vj. |
| Acidi benzoici, | | ʒiv. |
| Syr. tolutani, | | |
| Aquæ camphoræ, | āā | f℥iij. |

M. Sig: Take a dessertspoonful every four hours.

Inhalations of steam impregnated with the compound tincture of benzoin are beneficial in acute and chronic laryngitis. Morell Mackenzie uses a vapor of the compound tincture of benzoin, 1 drachm to a pint of water at 140° F., inhaled frequently for acute laryngitis.

The following gargle is recommended in pharyngitis:—

| | |
|---|---|
| ℞ Sodii benzoat., | gr. x. |
| Tinct. benzoin., | fʒss. |
| Infus. ros. fol., | f℥ss. |

M.

This remedy is also used with advantage in chronic diarrhœa and dysentery. In liver disorders, sodium benzoate, in 10- to 30-grain doses, is very useful, and also in cystitis. It is likewise beneficial in chronic indigestion dependent upon inactivity of the liver and accompanied by an abundant excretion of uric acid. This salt is also of service in septic and febrile diseases, several drachms daily (Senator). Owing to its solubility it is preferable to benzoic acid, and is equally as efficient in acute rheumatism. In scarlet fever and small-pox sodium benzoate reduces the temperature and mitigates the severity of the disease. This salt has proved very useful in the treatment of diphtheria, administered internally, and at the same time applied by insufflation to the seat of the lesion. Its employment has seemed to be attended with good results in typhoid fever and whooping-cough. The same remedy in the form of a spray has been extolled in phthisis, but it has no such decided effect upon the tubercle bacilli as had been hoped. Benzoic acid, in daily doses of 2½ to 3 drachms, has been found of service in acute rheumatism, but is inferior to salicylic acid. In erysipelas benzoic acid has been given with reported good results. It is of advantage in the treatment of chronic bronchitis.

In its exit from the system this acid acts as a gentle stimulant and local antiseptic to the bladder and urethra. In chronic cystitis with fermentation of urine and deposit of phosphates, benzoic acid is extremely useful, reducing the alkalinity of the fluid and the irritability of the bladder. For similar reasons it sometimes proves of service in chronic gonorrhœa, in obstinate irritation of the urethra due to the condition of the urine, and in incontinence caused by an alkaline reaction of the urine. In all these conditions ammonium benzoate may be used instead of the acid. The usual dose of the acid is 5 to 10 grains, of the salt 10 to 20 grains. Benzoic acid promotes the solubility of vesical gravel, whether composed of urates or phosphates. A favorite formula of Dr. Golding-Bird was:—

| | |
|---|---|
| ℞ Sodii carbonatis, | ʒjss. |
| Acid. benzoici, | gr. xl. |
| Sodii phosphatis, | ʒiij. |
| Aq. ferventis, | f℥iv. |
| Solve et adde— | |
| Aq. cinnamon, | f℥vijss. |
| Tr. hyoscyami, | fʒiv. |

M. Sig.: Two tablespoonfuls three times a day.

In uræmic conditions, or what has been called lithæmia, lithium benzoate has a most happy effect, carrying off the excess of uric acid and urates, acting also as a diuretic. Even in albuminuria, the benzoates have been used with advantage, especially calcium benzoate.

Freckles may be removed by the topical application of tincture of benzoin, containing corrosive chloride of mercury :—

| | |
|---|---|
| ℞ Hydrarg. chlor. corrosiv., | gr. ss. |
| Tincturæ benzoini, | fʒiiss. |
| Glycerini, | fʒij. |
| Aquæ rosæ, | f℥vj. |

M. Sig.: Use as a lotion to affected spots.

The above may also be used in pityriasis versicolor, or moth-spots, and chronic urticaria. The compound tincture of benzoin is sometimes able to relieve the itching of urticaria and eczema. A solution of benzoic acid in cologne-water makes a pleasant application, frequently successful in urticaria. Mixed with an equal quantity of glycerin, the tincture or the compound tincture is useful in chapped lips and hands. The compound tincture is a good styptic, and yields excellent results when injected into old sinuses. It disinfects the tract, and promotes healing. Benzoic acid is an efficient antiseptic application to unhealthy wounds and ulcers.

As a dentifrice Professor Miller recommends :—

| | |
|---|---|
| ℞ Acid. thymici, | gr. iv. |
| Acid. benzoici, | gr. xlv. |
| Tr. eucalypt. fol., | f℥ss. |
| Alcohol. absolut., | f℥iij. |
| Ol. gaulther., | gtt. xxv. |

M. Sig.: A teaspoonful or two in half a glass of water.

Bismuth benzoate is an excellent dressing to chronic, unhealthy, or sloughing ulcers, chancroids, open buboes, chancres, and ulcerated lesions of late syphilis. It is applied in the form of a powder, the surface having previously been thoroughly cleansed by a weak solution of corrosive sublimate.

## BENZOLUM, or BENZOL.

**Pharmacology.**—Benzol is often confounded with benzin, but is entirely different. Benzol is obtained from coal-tar, and is a definite chemical compound ($C_6H_6$), instead of being composite, like benzin. It is a thin, colorless fluid, very volatile and inflammable, and has an aromatic, not very unpleasant odor. It is almost insoluble in water, but dissolves in four parts of alcohol. It may be obtained by distilling a mixture of benzoic acid with lime, or by fractional distillation from naphtha,—a derivative of coal-tar.

**Physiological Action.**—Benzol is antiseptic and antiparasitic, with but little local action beyond the extraction of oily matters from the skin. Owing to its solvent action upon many alkaloids, it might be useful in local medication by enabling the remedy to penetrate the skin. Taken internally, benzol produces intoxication, anæsthesia, and coma.

**Therapy.**—It has been given in a few drop doses as a remedy for dyspepsia, and also in trichinosis. It is employed in pharmacy as a solvent, but is not often administered or employed in practical medicine. Dr. A. Da Socca has used, locally, with alleged good result, a mixture of 1 to 6 of tincture of iodine and benzol in diphtheria. Benzol has been advantageously given in whooping-cough by Dr. Robertson, in doses of 2 minims in mucilage to children six months of age. The same writer reports good results from the use of benzol in influenza. He administered it in the form of an emulsion in lemonade, 5 minims at a dose, repeated every three hours. It was always well tolerated. It had the effect of reducing temperature and relieving the general discomfort. Convalescence was generally rapid.* Dr. Mundel corroborates the statements of Dr. Robertson and has, moreover, employed benzol in chronic bronchitis and winter cough. Dr. Mundel gives it according to the following formula:—

| | | |
|---|---|---|
| ℞ Benzol. pur., . . . . . . . . . | | fʒjss. |
| Ol. menth. pip., . . . . . . . . | | fʒss. |
| Ol. olivæ, . . . . . . . | q. s. ad | f℥ij |

M. Sig.: Ten to thirty drops on sugar every three or four hours.

Cases of acute or chronic poisoning are observed in consequence of the absorption of **Nitro-benzol**. This product, known commercially as the oil of mirbane or artificial almond-oil, is used extensively in the manufacture of dyes, perfumery and explosive compounds. The workmen subjected to its influence frequently suffer from a train of symptoms which have been studied by Dr. Prosser White. The usual manifestations are sleepiness, headache, languor, and a severe form of anæmia. There is a decided loss of weight, the appetite becomes capricious or altogether fails, nausea and vomiting may occur, the urine becomes darkened in color and contains anilin. The temperature of the body is slightly raised, but the extremities become very quickly chilled. There is excessive waste of the muscles, especially those of the extremities. Hyperæsthesia is a characteristic symptom. Sensation in the extremities may be slightly impaired. The sexual appetite is weakened or lost. The reflexes are generally enfeebled. The eyes are not usually affected, though nitro-benzol may produce a peculiar form of retinitis with great defect of sight. The pulse is feeble and thready, arterial tension is low, the blood is chocolate-colored or black. The corpuscles are decreased. No direct antidote is known. It is said that when taken into the stomach, nitro-benzol may remain for some time unabsorbed and an emetic or the stomach-pump may, therefore, be of service. A saline cathartic is also advisable, but oils, fats and alcohol are not recommended. Counter-irritation to the chest, friction of the limbs, and ammonia as a stimulant may be employed. Artificial respiration is of avail. Dr. White states that 15 drops taken by the mouth have caused death. Letheby and Filehne give the fatal dose as varying from 2 minims to 2 drachms. A case has, however, been reported by Dr. E. Cissel, of Vienna, in which a woman took nearly 3½ ounces of nitro-benzol and yet recovered. The symptoms were deep cyanosis, superficial respiration, small pulse and dribbling of urine, which contained the toxic agent. Camphor injections were administered and artificial respiration was practised. Consciousness returned and on the fourth day the urine resembled that of a case of cystitis.

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* *London Lancet*, November 11, 1893.

### BERBERIS.—Barberry.

*Preparations.*

*Extractum Berberidis Fluidum.—Dose,* ♏x–xxx.

*Tinctura Berberidis.—Dose,* ♏xx–fʒj.

*Berberina,* or *Berberinæ Hydrochloras.*—Berberine, or Berberine Hydrochlorate. *Dose,* gr. ¼–v.

**Pharmacology and Therapy.**—The root of the Oregon grape, or Berberis aquifolium (Berberidaceæ), growing on the Pacific Slope of North America, contains an alkaloid, **Berberine,** which also exists in Hydrastis.

This drug, in the form of fluid extract (dose, ♏x–xxx), is tonic and diuretic, and is believed to have some power as an alterative, making it valuable for the treatment of blood diseases, dyspepsia, hepatic disorder, habitual constipation, and skin diseases dependent upon unhealthy secretions or conditions of the digestive tract. Vehsemeyer claims to have produced decided improvement in the case of an infant afflicted with leukæmia by the administration of berberine sulphate. M. Fellner has successfully employed berberine phosphate in the treatment of hæmorrhage due to uterine fibroids. Berberis has been topically employed in conjunctivitis, and the berberine hydrochlorate has been used with advantage as an injection in gonorrhœa.

### BERGAMIA.—Bergamot.

*Preparation.*

*Oleum Bergamottæ* (U. S. P.).—Oil of Bergamot.

**Pharmacology and Therapy.**—A volatile oil from the Citrus bergamia (Aurantiaceæ), obtained from the rind of the fresh fruit, which also contains **Bergaptene,** or bergamot camphor. The odor makes bergamot valuable in perfumery; and it probably has antiseptic and stimulating qualities, but is not used medicinally.

### BETA.—BEET.

**Pharmacology and Therapy.**—The fleshy napiform root of Beta vulgaris (Chenopodiaceæ) is cultivated for food, as a vegetable, and from its saccharine juice a good quality of sugar is obtained. A strong infusion of the fresh root (f℥ii–iv, taken at bed-time or early in the morning) is said by Kazatchkoff to be useful in the treatment of chronic constipation and hæmorrhoids. It is claimed that it does not cause pain or rumbling.

## BISMUTHUM.—Bismuth.

### *Preparations.*

*Bismuthi Citras* (U. S. P.).—Bismuth Citrate. *Dose*, gr. i–v.
*Bismuthi Subcarbonas* (U. S. P.).—Bismuth Subcarbonate. *Dose*, gr. v–xx.
*Bismuthi Subnitras* (U. S. P.).—Bismuth Subnitrate. *Dose*, gr. v–xx.
*Bismuthi et Ammoniæ Citras* (U. S. P.).—Bismuth and Ammonium Citrate. *Dose*, gr. i–v.
*Bismuthi Salicylas.*—Bismuth Salicylate. *Dose*, gr. i–xx.
*Bismuthi Oleas.*—Bismuth Oleate (20 per cent.). External use.
*Bismuthi Subiodidum.*—Bismuth Subiodide. External use.

**Pharmacology and Physiological Action.**—Bismuth in the metallic form is not official, and has no medical interest. Its salts, however, are of great value; the insoluble ones differing greatly in their applications from those which are soluble. The subnitrate and subcarbonate are or should be in the form of white, impalpable powder, which has a slight astringent and absorbent action when dusted upon excoriated or ulcerated surfaces. When taken internally, these salts have very much the same effect along the digestive tract as upon the surface of the body, checking excessive secretion and exerting a sedative influence. When injected under the skin, part of the salt is absorbed and poisoning may result. Or, if large doses are taken by the mouth, death may follow from gastro-enteritis, the symptoms being very much like those caused by gold, lead, and mercury. After death, bismuth is found in the liver and other viscera, and in the urine and saliva. A purplish line upon the gums, recalling that of lead, has been noticed. The treatment is by demulcents, washing out the stomach, and the administration of the antidotes to arsenic, with which native bismuth is usually combined. When the soluble preparations are given for a considerable time, the bismuth is apt to accumulate in the liver; but this is not likely to follow the administration of the insoluble salts. The solutions, or elixirs, purporting to contain bismuth in combination with pepsin, are both unscientific and dangerous. The discharge from the bowels are blackened by bismuth. The prolonged administration of bismuth subnitrate has been known to cause a large intestinal concretion. It may, under these circumstances, also give rise to sloughs in the mouth and gastro-intestinal canal, to desquamative nephritis and albuminuria. The tongue becomes coated with a blackish fur.

**Therapy.**—In using bismuth it is essential that it shall be pure and free from arsenic. When well made, the subnitrate or subcarbonate is very useful as a dusting-powder for infants, or for intertrigo in adults. It has also been used to dust over excoriated surfaces, and as a dressing after wounds or amputations; in this case its weight is an objection to its employment; but it is very valuable in small wounds and in some old ulcers. Combined with mucilage (ʒj to ℥vi–viij), it is a good injection for gonorrhœa during the early stage; or it may be used as a soluble bougie, or as a vaginal suppository for leucorrhœa. The same preparation is likewise useful in ulcer of the rectum.

A small proportion of carbolic acid or aristol will enhance its antiseptic effect. In acne, intertrigo, and erythema in infants, or vesicular eczema, the bismuth may be lightly dusted over the surface. In the case of wounds the red oxyiodide is preferred to iodoform as an antiseptic and as an ointment in skin diseases. This salt is a local anæsthetic and antiseptic. It does not stain the skin or clothing, and may be employed as a dusting-powder or an ointment. It is an excellent application to chancres, chancroids, open buboes, ulcers, unhealthy wounds, and phlegmonous erysipelas. The following is a good combination :—

| | |
|---|---|
| ℞ Naphthalini, . . . . . . . . . . | ʒss. |
| Bismuthi subiodidi, . . . . . . . . | ʒj. |
| Unguenti simplicis, . . . . . . . . | ʒviss. |

M. et ft. ungt. Useful upon chancres, chancroids, and syphilitic ulcers.

The yellow oxyiodide is more suitable for mucous membranes (dose, gr. v–xx).

Bismuth-powder has been used with success in simple ozæna, snuffed into the nostrils, though it is inferior to other remedies. It may also be employed in aphthous or nursing sore mouth, and in mercurial ptyalism. It may be of service in chronic conjunctivitis and granular lids. Made into an ointment, bismuth subnitrate is an excellent application to chancroids, irritable ulcers, erysipelas, blisters, pemphigus after the bullæ have ruptured, leaving raw surfaces exposed, the erythematous and bullous forms of burns, and in the first stage of dermatitis. In these conditions an ointment may be thus composed :—

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| ℞ Bismuthi subnitratis, . . . . . . . . | ʒss. |
| Pulv. marantæ, . . . . . . . . . . | ʒss. |
| Morphinæ sulphatis, . . . . . . . . . | gr. iij. |
| Lanolini, . . . . . . . . . . . . | ℥ss. |

M. et ft. ungt.

An ointment consisting of bismuth subnitrate and boric acid with lanolin and olive-oil is regarded by Wertheimer as particularly appropriate to the treatment of burns in children. An ointment containing the oleate of bismuth is also valuable in diseases of the skin. It may be prescribed as follows :—

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|---|---|
| ℞ Extr. belladonnæ folior. alc., . . . . . . . | gr. x. |
| Extr. opii, . . . . . . . . . . . . | gr. xx. |
| Ungt. bismuthi oleatis, . . . . . . . . | ℥ss. |

M. For furuncles, carbuncles, and eczema of the genitals.

The internal administration of bismuth preparations is for their local action upon the stomach and intestinal tract. They form a coating over the inflamed or irritated surfaces and keep them from coming in contact, while they also exert an astringent and sedative effect. In gastralgia, irritable stomach, and some dyspeptic conditions they are of much value :—

| | |
|---|---|
| ℞ Bismuthi subnitratis, . . . . . . . . | ʒij. |
| Pepsini saccharati, . . . . . . . . . | ʒj. |
| Creosoti, . . . . . . . . . . . . | ♏iv. |

M. Divide in chartulæ no. xij.

Sig.: Give one every hour until relieved. (The oil of gaultheria may be substituted for the creosote, in case of children, and the powders made smaller.)

In painful dyspepsia and gastralgia the late Dujardin-Beaumetz prescribed :—

℞ Bismuth. subnitratis,
Magnesiæ,
Cretæ ppt.,
Calcii phosphatis, . . . . . . . . āā ʒ ijss.
M. et div. in chart. no. xl.
Sig.: One powder before each meal.

Bismuth may be given in powder also, as:—

℞ Bismuth. subnit.,
Magnesii carbonatis, . . . . . . . . āā ʒj.
Morphinæ sulphatis, . . . . . . . . . gr. j.
M. et ft. chartæ no. xij.
Sig.: A powder every hour or two. Employ in gastralgia, dyspepsia attended with acidity, and in cancer of the stomach.

In children suffering with irritable stomach, the result of improper feeding, a good combination is:—

℞ Bismuth. subnit., . . . . . . . . . ʒ ss.
Sodii bicarb.,
Pulv. rhei, . . . . . . . . . . āā gr. x.
M. et ft. chartæ no. x.
Sig.: A powder every four hours.

The following liquid combinations of bismuth are likewise of service, especially in gastric catarrh and some varieties of dyspepsia:—

℞ Bismuth. citratis, . . . . . . . . . ʒ ij.
Glycerini pepsinæ, . . . . . . . . . f℥ iij.
M. Sig.: A teaspoonful before meals.

℞ Bismuth. subnit., . . . . . . . . . ʒ ij.
Pulv. rhei, . . . . . . . . . . . ʒ iss.
Pulv. acaciæ, . . . . . . . . . . . ʒ ij.
Spt. myristicæ, . . . . . . . . . . fʒ ij.
Aquæ menth. pip., . . . . . . . . . f℥ viij.
M. Sig.: A tablespoonful in water every four hours.

In gastro-enteritis, or summer complaint in young infants, the salicylate gives excellent results in 1- or 2-grain doses. The salicylate is a soft, white powder, insoluble in water, alcohol, ether and chloroform, but soluble in acids. This combination is likewise valuable in the diarrhœa of typhoid fever, in which it is serviceably given with naphthol. Bismuth salicylate is useful for the purpose of securing gastric antisepsis in cancer of the stomach. It may be associated with beta-naphthol or salol. This salt also is highly esteemed as a remedy in infantile diarrhœa.

Gastric ulcer is much benefited by the subnitrate in 10- or 15-grain doses, given every three hours, or oftener, if there is much pain. Where malignant ulceration is suspected, opium and belladonna may be administered at the same time. The vomiting of pregnancy may sometimes be relieved by bismuth subnitrate. It serves a useful purpose in the chronic gastritis so common in drunkards. In acidity of the stomach it is useful, and in flatulent dyspepsia. A combination of bismuth with charcoal is efficacious in the latter condition, as:—

℞ Bismuthi subnitratis,
Pulveris aromatici, . . . . . . . . āā ʒ ij.
Carbonis ligni (recentis), . . . . . . . ʒ ss.
M. et div. in chart. no. xij.

In diarrhœa, the subnitrate is usually a reliable remedy, but, as Ringer advises, it should be preceded by a dose of castor-oil, in order to remove any possible cause of irritation. In the diarrhœa of phthisis, it can be given in combination with pepsin or pancreatin. It may be given in hot milk to children; but it is almost tasteless, and may be placed at once upon the tongue and washed down with water or milk. In chronic diarrhœa, bismuth subnitrate not infrequently affords marked relief. An excellent prescription for diarrhœa, particularly when acute, is :—

| | |
|---|---|
| ℞ Bismuth. subnit., | ℥iiss. |
| Pulveris myristicæ, | ℈ij. |
| Aquæ cinnamomi, | |
| Syrup. acaciæ, | āā f℥ij. |

M. Sig.: Two teaspoonfuls every half-hour, or hour, until relieved.

In cases of infantile diarrhœa, when the stools are green-colored, contain caseine, and are accompanied by abdominal pain, Dr. Zinnès relies upon the following prescriptions :—

| | |
|---|---|
| ℞ Bismuth. subnitrat., | gr. xlv. |
| Liq. calcis, | fʒjss. |
| Syrup. aurant. | f℥ss. |
| Aquæ fœniculi, | f℥ij. |

M. Sig.: Teaspoonful every two hours.

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|---|---|
| ℞ Bismuth. subnitrat., | gr. xlv. |
| Syrup. aurant., | f℥ss. |
| Infus. calumbæ, | f℥ij. |

M. Sig.: One or two teaspoonfuls every two hours.

In epidemic dysentery large doses of bismuth have been administered with benefit. Trousseau was accustomed to order bismuth injections in dysentery.

A solution of bismuth and ammonia citrate is official in the British Pharmacopœia :—

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|---|---|
| ℞ Bismuthi et ammoniæ citrat., | gr. v. |
| Aquæ chloroformi, | f℥ss. |
| Elixir aurantii, | fʒiss. |

M. Sig.: Take half an ounce three or four times daily, for irritable stomach.

This double salt has been employed in the treatment of acute and chronic diarrhœa. P. Vigier has prepared a bismuth benzoate as a substitute for the bismuth salicylate or subnitrate. Bismuth benzoate contains 27 per cent. of benzoic acid, and may be advantageously used as an intestinal antiseptic, and is a preferable substance to the salicylate as regards its elimination by the kidneys.

**Dermatol.**—Under this name Drs. Heinz and Liebrecht have introduced a new combination,—bismuth subgallate. This occurs in the form of a fine, saffron-yellow powder, odorless and innocuous; insoluble in water, alcohol, and ether; not hydroscopic, or otherwise affected by exposure to air or light. It possesses astringent, antiseptic, and desiccant properties. This substance is also possessed of local anæsthetic power. It is of especial value in lesions attended by profuse secretion, as eczema, burns, ulcers, wounds, and diseases of the eye and ear. Dr. Eugene Doernberger reports excellent results from the use of dermatol in pemphigus, herpes zoster, and abscesses of the skin occurring in children. Dermatol has been advantageously applied to chancroids and ulcerated chancres, to balanitis, varicose and other ulcers of the leg. Suspended in the mucilage it has been used as an injection in acute and chronic gonorrhœa. Mixed with an equal quantity of castor-oil, Grossman has employed it in the treatment of sore nipples. It is considered of value as a dressing to abdominal wounds and in perineoplasty. Tampons made of gauze impregnated with dermatol are of service in the treatment of vaginal catarrh. A powder composed of 20 parts of dermatol, 10 parts of starch and 70 parts of talc is a good application in hyperidrosis of the hands and feet. Dermatol may be used pure as a dusting-powder, as a 25-per-cent. ointment, a collodion emulsion and as a 10- to 20-per-cent. gauze.

Colasanti and Dutto report favorably of the internal employment of dermatol in different forms of diarrhœa, including that of typhoid fever and tuberculosis. It was given in daily doses of 30 to 45 grains in divided portions. Dr. Austin Flint recommends bismuth subgallate in the treatment of fermentative dyspepsia. He has had excellent results from its use in chronic cases, giving 5 grains in capsule or tablet before or after each meal. A number of loose combinations of bismuth have lately been introduced as antiseptic remedies. Phenol-bismuth, cresol-bismuth and beta-napthol bismuth are decomposed in the stomach, the phenol and cresol being absorbed and eliminated by the kidneys, while the bismuth is almost completely removed by the bowels. Naphthol is partly eliminated with the urine and partly through the intestine. In daily doses of 15 to 45 grains Dr. Jasenski, of St. Petersburg, gave phenol-bismuth with advantage in typhoid fever, acute and chronic gatric and gastro-intestinal catarrh and in diarrhœa. Tribromphenol bismuth is a yellow, insoluble powder, without odor or taste and almost free from toxic action. It contains 49.5 per cent. of bismuth oxide and 50 per cent. of tribromphenol. Professor Hueppe, of Prague, recommends it as a valuable agent in the treatment of Asiatic cholera. Beta-naphthol bismuth is a brown, odorless powder, insoluble in water and containing 80 per cent. of bismuth oxide. In doses of 15 to 30 grains it acts as an excellent intestinal antiseptic. Both beta-naphthol and tribromphenol bismuth are efficient remedies in fermentative dyspepsia, and chronic intestinal catarrh dependent upon the presence of micro-organisms. Dr. Reynold W. Wilcox has found the former compound answer an excellent purpose in chronic membranous enteritis. Tribromphenol bismuth possesses rather a sweetish taste and shares the astringent properties of other compounds of bismuth.

**Dermol.**—Bismuth chrysophanate has been introduced under the name of dermol. It is an amorphous yellow powder of neutral reaction, insoluble in the ordinary menstrua. It is proposed for use in the form of ointment in diseases of the integument.

**Thioform.**—This is a combination of bismuth, sulphur and salicylic acid and occurs in the form of a light grayish-yellow powder insoluble in water, alcohol and ether. Thioform is devoid of odor or taste. It is comparatively free from toxic effects and has been used with success upon burns, ulcers and sloughing wounds. Dr. E. Fromm reports favorably concerning its action in conjunctivitis, purulent ophthalmia and the strumous ophthalmia of children. Thioform has also been employed as a styptic in the operation of enucleating the eyeball.

Bismuth sulphite has been found useful by Cesaris and Racchetti as an intestinal antiseptic and anthelmintic.

## BOLDUS.—Boldo.

**Pharmacology and Physiological Action.**—The Peumus boldus (Monimiaceæ) is an evergreen belonging to the western coast of South America. The leaves and small stems contain a bitter extractive, a volatile oil, and a bitter alkaloid (or glucoside?), **Boldoin.** A tincture (5 per cent.) is used in 5-minum doses or more, gradually increasing, and produces vomiting and purging in full doses, and also a sedative or narcotic effect upon the brain. In small doses it is carminative and stimulant to the stomach.

**Therapy.**—In South America this plant has some reputation for its influence upon genito-urinary disorders, gonorrhœa, gleet, cystitis, and catarrhal inflammations of the kidneys. It has also been used for rheumatism, and as a tonic in dyspepsia and general debility. In cirrhosis, it is especially recommended by Campenon. Boldoin, the active principle, has hypnotic powers, and has been successfully tried in France as a substitute for opium or chloral (Juranville).

## BROMUM (U. S. P.).—Bromine.

**Dose, ♏ii–iij.**

### *Preparations.*

*Ammonii Bromidum* (U. S. P.).—Ammonium Bromide. *Dose*, gr. x–xl.
*Calcii Bromidum* (U. S. P.).—Calcium Bromide. *Dose*, gr. v–xxx.
*Potassii Bromidum* (U. S. P.).—Potassium Bromide. *Dose*, gr. x–ʒj.
*Lithii Bromidum* (U. S. P.).—Lithium Bromide. *Dose*, gr. v–xx.
*Sodii Bromidum* (U. S. P.).—Sodium Bromide. *Dose*, gr. x–ʒj.
*Zinci Bromidum* (U. S. P.).—Zinc Bromide. *Dose*, gr. i–ij.
*Acidum Hydrobromicum Dilutum* (U. S. P.).—Diluted Hydrobromic Acid (10 per cent.). *Dose*, ♏xx–fʒij.
*Syrupus Ferri Bromidi.*—Syrup of Ferrous Bromide (10 per cent.). *Dose*, ♏x–fʒj.
*Camphora Monobromata* (U. S. P.).—Monobromated Camphor. *Dose*, gr. v.
*Niccoli Bromidum.*—Nickel Bromide. *Dose*, gr. i–v.
*Coniinæ Hydrobromas.*—Coniine Hydrobromate. *Dose*, gr. $\frac{1}{16}$–$\frac{1}{12}$.
*Bromoform.*—Tribrom-Methane. *Dose*, ♏ii–x.

**Pharmacology.**—Bromine, which obtains its name from its offensive odor, is a brownish-red, non-metallic liquid element, obtained from sea-water; combining readily with alcohol, ether, or chloroform, and soluble in 33 parts of water at 59° F. When added to water, ozone is liberated. It completely volatilizes upon exposure to the air, giving off a highly irritating, suffocating odor like that of chlorine, with which it may be contaminated. The pharmacopœial tests require the chlorine to be not more than 3 per cent., and that there shall be only traces of iodine.

**Physiological Action.**—It is unfortunate that the smell of bromine is so obnoxious, since it is a true disinfectant, rivaling mercuric chloride, and, it is claimed, has even more influence than that agent in preventing the development of spores. A 2-per-cent. solution in water destroys the spores of anthrax. Applied to the skin, it is a penetrating caustic in its pure state, and, diluted, is astringent and antiseptic. Internally, its effects resemble those of iodine and chlorine, causing paralysis of the brain-centres, death resulting from paralysis of respiration. After death the bromides are found in the brain, principally (Doyon).

In cases of poisoning by swallowing this agent, the stomach must be thoroughly irrigated, and a purgative like croton-oil administered in alkaline solution (Vichy water). When inhaled, warm vapor from the steam-atomizer with alkaline solution (Dobell's solution) would afford relief to the irritation. The bromides taken upon an empty stomach in concentrated form sometimes cause gastralgia, which may be relieved by hot water and a hypodermic injection of morphine, combined with atropine, if stupor be present.

In medicinal doses, the bromides and hydrobromic acid exert a sedative effect upon the functions of the brain, produce insensibility of the mucous membrane of the fauces, and allay irritability of sensory nerves, as is very well shown in the case of tinnitus aurium after administration of quinine. It has some special effect upon the genito-urinary tract, obtunding sensibility and preventing erections or ovarian excitement. On the other hand, sodium bromide has, in a few instances, been known to produce nocturnal erections and seminal emissions. This is probably due largely to the influence of the bromides upon the spinal cord, reducing reflex action and, when continued, diminishing motor power and producing paralysis of the legs. The circulation is also affected by action upon the cardiac ganglia. In the case of potassium bromide, we have superadded the toxic action of potash upon the heart-muscle, by reason of which, when given in large doses, the arterial tension is reduced and the pulse-rate lowered. In the usual doses this effect is hardly observable.

According to the studies of Germain Sée, potassium bromide causes dilatation of the heart. The right side of the organ appears to be more decidedly affected. It is said (by Hammond) to reduce the cerebral circulation, causing anæmia by contraction of the arterioles. It is probable that the hypnotic effect of bromides is due more directly to their action upon the brain-centres, especially the motor and intellectual portion of the cortex cerebri. To its faculty of reducing reflex nervous excitability is to be ascribed its well-known antispasmodic effects in convulsive disorders. No marked effect upon temperature or respiration has been observed from medicinal doses; very large doses may reduce both, and also diminish tissue waste.

The rate and the force of the heart's action are likewise diminished and arterial pressure reduced by excessive doses. When continually administered in moderately large doses, the bromides sometimes excite nausea and diarrhœa. A sedative action is exerted by the bromides upon the sympathetic nervous system.

The bromides have considerable diffusive power, and are found in most of the secretions and in the interior of glands like the liver. After long administration they accumulate particularly in this organ. The amount of bromide retained in the liver is very great. It has been surmised that this saturation of the system by bromide predisposes to tuberculosis. M. Féré states that although he has seen nothing in patients to corroborate the supposition, guinea-pigs saturated with potassium bromide and inoculated with tuberculosis succumb more rapidly than animals to whom the salt had not been given. It has likewise been shown that the bromides accumulate in the brain and other organs. The glandular elements of the skin are stimulated and an acneiform eruption follows their prolonged use.

The use of the bromides is occasionally followed by the development of erythema or a brownish discoloration. In other instances it has caused an eruption similar to that of eczema, wheals or ulcers. The effect upon the skin may be produced within a day or two after administration of the drug, but usually occurs only after saturation of the system. An eruption occasionally appears upon the body of a nursing infant, when the mother is upon a course of bromide treatment. They are eliminated from the system by the secretions generally, but more particularly by those of the fauces, skin, bronchi, bowels, and kidneys. Absorption is much more rapid than elimination.

**Therapy.**—For its caustic effect, bromine has been used in alcohol (1 to 2 or 3) in hospital gangrene, and in gynæcology as an application to cancer of the uterus. Diluted with sweet-oil (♏x to ℥j), it is a sedative dressing for rhus-poisoning or chancroids. Bromine is employed, like carbolic acid, as a disinfectant for drains, but is too offensive for use in this way in the sick-room. The bromides are not often used as topical remedies, though an aqueous solution of the strength of 10 or 20 grains to the ounce may be serviceable in paræsthesia. Finely-powdered potassium bromide is stimulant to chronic ulcers, and has been advantageous in epithelioma. It has been applied, added to 5 parts of glycerin, to hæmorrhoids and fissure of the anus, in order to relieve pain. In treating laryngeal diphtheria, or membranous croup, the following may be used :—

℞ Bromi, . . . . . . . . . . . . ♏v.
Potassii bromidi, . . . . . . . . . ʒj.
Syrupi simplicis, . . . . . . . . . f℥ viiss.
Decocti althææ, . . . . . . . q. s. ad f℥ iv.—M.

For a child of one year the bromine should be reduced to one-third, and from one to four years two-thirds, of the quantity in this formula, of which an ounce is to be given every hour, while the symptoms are urgent (Redenbacher). The official solution of hydrobromic acid has not answered the expectation of those who urged its use as a substitute for the bromides; it may be less liable to produce acne, but it is irritating and less efficient. It may be given for the relief of tinnitus aurium, headache, or to prevent unpleasant symptoms from the effects of quinine:—

℞ Quininæ hydrobromat., . . . . . . . gr. xxiv.
Acid. hydrobromic. dilut., . . . . . . . f℥ ss.
Elixir. aurantii, . . . . . . . . . f℥ iiiss.
M. Sig.: Dose, a tablespoonful after meals.

**Special Applications.**—The special use of the bromides is found in the treatment of convulsive disorders, such as spasm of the larynx or epilepsy. In the former affection a few doses of 10 or more grains in a child are usually sufficient to accomplish a cure; but in the latter the treatment often extends over months and years. When the bromides are continued for a long time, **bromism** is apt to be produced, the physiological action of bromine being shown by eruptions upon the skin, especially of the face, loss of reflexes, dragging heavy sensations, and difficulty in locomotion, and in some cases special tendency to convulsive attacks appear. It therefore becomes necessary to intermit the bromide or change from one to another, and if there is too much depression of the vital powers digitalis may be prescribed in combination, or strychnine given hypodermically in minute doses (gr. $\frac{1}{120}$-$\frac{1}{60}$) several times daily. Brown-Séquard prefers a combination like the following, in treating epilepsy, for a child ten years of age:—

| | | |
|---|---|---|
| ℞ | Potassii iodidi, | ʒj. |
| | Potassii bromidi, | ℥j. |
| | Ammonii bromidi, | ʒiiss. |
| | Potassii bicarbonatis, | gr. xl. |
| | Spiritus chloroformi, | fʒij. |
| | Infusi calumbæ, q. s. ad | f℥vj. |

M. Dose, two drachms morning and noon and three drachms at night, diminishing the quantity after the convulsions cease, but continuing the remedy at intervals, especially at the time when the fits are liable to recur. If the patient be weak, the infusion of digitalis may be substituted for the calumba.

M. Ch. Féré states that most of the ill effects of the bromide may be avoided by the simultaneous administration of an intestinal antiseptic. In the management of epilepsy he has often made use of the following combination:—

| | | |
|---|---|---|
| ℞ | Potassii bromid., | ʒjss. |
| | Beta-naphthol., | ʒj. |
| | Sodii salicylat., | ʒss. |

M. Sig.: To be divided into three doses. One dose to be taken three times a day.

In treating epilepsy the partial insensibility of the fauces is the guide to the administration of bromides; this should be established as soon as possible and maintained during the continuance of the treatment, which should not be pushed to the point of bromism. Small doses of arsenic will prevent, to some degree, the eruption in persons especially susceptible to bromides, and it is well to alternate the iodides with the bromides in order to prevent undue accumulation of the latter in the system. The beneficial action of the bromides is particularly marked when epilepsy is due to disorder of the sexual apparatus. On the other hand, the petit mal is much less amenable to their influence than the general convulsive seizures. Potassium bromide has a certain sphere of usefulness in whooping-cough. It is of no avail when the bronchitis is severe, or when pneumonia is present; but in simple uncomplicated pertussis, above all when convulsions or a tendency to convulsions exist, this remedy is of great service in allaying the congestion of the nervous centres. Spasmodic asthma is, in some instances, considerably benefited by the exhibition of bromide, and its efficacy is enhanced by combination with the iodide. The bromides are of decided value in infantile convulsions, especially when these depend upon reflex irritation. They are likewise of service in the convulsions symptomatic of simple meningitis, and not altogether without avail in alleviating those of tubercular meningitis. Uræmic convulsions may sometimes be successfully treated by potassium bromide in combination with chloral hydrate, assisted by active purgation and diaphoresis. When cholera infantum is associated with excessive nervous irritability, potassium bromide serves a useful purpose, as it does also in those cases in which flatulent colic of infants is connected with marked intestinal spasm. Dr. Harvey Vanatta, of Seal, Ohio, administered potassium bromide with success in a case of invagination of the bowel.

In treating nervous irritability, restlessness, and insomnia, it is well to combine bromides with other hypnotic agents :

| | |
|---|---|
| ℞ Potassii bromidi, | gr. xv vel xx. |
| Chloralis hydrat., | gr. x. |
| Aquæ camphoræ, | fʒj. |
| Syr. lactucarii, | fʒj. |

M. Sig.: Pro dosi. For nervous headache with insomnia.

The sedative and antispasmodic effects are increased by combination with gelsemium, asafœtida, or valerian, and smaller doses are required than when each agent is administered alone. In Menière's disease Ferreri reports good results from the use of large doses of potassium bromide in conjunction with ferric valerianate. In the affections of the genito-urinary organs, the bromides are of especial value when spasm or pain is present. The quantity of urine is increased and also the proportion of urea. The sexual functions are depressed; and the bromides are largely used as **anaphrodisiacs** in priapism and nymphomania, especially when given in conjunction with tartar emetic in minute doses.

A good formula used by the author for gonorrhœa with chordee is the following:—

| | | |
|---|---|---|
| ℞ Potassii bicarb., | | ʒiij. |
| Potassii bromidi, | | ʒiv. |
| Tincturæ hyoscyami, | | f℥j. |
| Spiritus chloroformi, | | f℥iv. |
| Inf. buchu, | q. s. ad | f℥viij. |

M. Sig. : A tablespoonful in barley-water every three or four hours. This combination relieves scalding and chordee.

The following are also valuable prescriptions containing the bromides :—

| | | |
|---|---|---|
| ℞ Sodii bromidi, | | ʒvij. |
| Antimonii et potassii tart., | | gr. ss. |
| Aquæ camphoræ, | | |
| Spiritus ætheris nitrosi, | āā | f℥iss. |
| Syrupi aurantii, | | f℥ij. |

M. Sig. : Two teaspoonfuls in water every two or three hours until relieved. Serviceable in epididymitis, cystitis, and prostatitis.

| | | |
|---|---|---|
| ℞ Ammonii bromidi, | | |
| Saloli, | āā | ʒj. |

M. et ft. capsulæ no. xij.

Sig.: Two capsules every hour or two. Employ in gonorrhœa and all irritable conditions of the genito-urinary organs.

The menses are delayed and rendered less in quantity by the use of the bromides. When menorrhagia is caused by ovarian congestion potassium bromide restrains the flow, and the same agent sometimes proves of service in metrorrhagia. In the profuse and irregular menstrual discharges, which often occur as the menopause is neared, the same remedy is of value. The headaches, flushing of the face, subjective sensations of heat, and other anomalous symptoms which characterize the same period, receive notable relief from the bromides. Chordee occasionally yields to the same agent. In spermatorrhœa and atonic impotence, dependent upon irritation or subacute chronic inflammation of the deep urethra, the bromide is valuable by diminishing the reflex irritability of the genital centre in the cord. But in diurnal pollution due to debility of the genital centre, this remedy is harmful and should be avoided. In all cases of reflex nervous disorders having origin in ovarian irritation, the bromides have a well-established reputation, but should not be given freely in anæmic subjects. In uterine cough, stomach-cough, ear-cough, etc., we may give:—

℞ Potassii bromidi, . . . . . . . . . gr. v vel x.
Syr. pruni Virg., . . . . . . . . . . f ʒ ij.
M. Take every four to six hours. The above is also useful in the cough of children.

When it is desired, in laryngology, to make an examination or an operation upon a very sensitive throat, the use, for a few days, of full doses of potassium bromide will greatly assist in reducing such hyperæsthesia. In various hysterical throat affections, the bromides are of the greatest value.

In irritability of the bladder in women who use sewing-machines, or others, the following is serviceable:—

℞ Potassii vel sodii bromidi, . . . . . . gr. xx.
Infus. uvæ ursi, . . . . . . . . . f ʒ j.
M. Sig.: Take every hour or two until relieved.

In migraine the combination with opium is valuable:—

℞ Tr. opii deodorat., . . . . . . . . . f ʒ j.
Potassii bromid., . . . . . . . . . ʒ ii–iiss.
Acid. hydrobromic. dilut., . . . . . . f ℥ ij.
Syr. aurantii flor., . . . . . . q. s. ad f ℥ iv.
M. Sig.: Take a dessertspoonful in water, every two or three hours.

Cases of maniacal excitement, puerperal, alcoholic, or other, are relieved by full doses of bromides.

Many acute attacks of fever in children, with delirium, are promptly cured by bromides in small doses given every few minutes. Sea-sickness and the vomiting of pregnancy are controlled by small doses of bromides in effervescent salt; large doses have occasioned temporary derangement of mind, and have brought this remedy into disrepute because improperly used. In poisoning by strychnine and in tetanus large doses of the bromides have proved successful in subduing the convulsions.

In acute cerebral congestion, potassium bromide is of great value through its influence upon the vaso-motor system. It is very serviceably given in conjunction with the fluid extract of ergot, which aids its action by constringing the cerebral vessels. The headache and wakefulness are also relieved by the bromide. The same drug is efficacious in allaying cerebral vomiting. Insomnia, caused by nervous strain or excessive mental application, is successfully treated by means of the bromide. The headache of pachymeningitis is generally best controlled by a combination of potassium bromide and iodide, as—

℞ Potassii iodidi, . . . . . . . . . . . . ʒ iiss.
Potass. bromidi, . . . . . . . . . . . . ʒ v.
Syrupi aurantii,
Syrupi simplicis, . . . . . . . . . . . āā f℥ ij.
M. Sig.: Dose, two teaspoonfuls three or four times daily.

In exophthalmic goitre, the excessive cardiac action may often be restrained by the bromide. This remedy may be useful in subacute and acute rheumatism, especially when the acute form of the disease is accompanied by considerable fever and delirium. The restlessness and delirium of the third week of typhoid fever is often admirably controlled by a bromide. The same agent is very efficacious in preventing the night terrors of children. It is claimed that potassium bromide is useful in diabetes mellitus of nervous origin. The salt relaxes nervous spasm of the œsophagus and allays the nervous symptoms of rachitis. Potassium bromide and iodide are recommended in eliminating metals, as mercury, copper, or lead, from the system. The bromide may be useful in reducing enlarged lymphatic glands and spleen, though far inferior to the iodide. A bromide increases the effect of hypnotic or narcotic medicines, and it is often able to obviate the unpleasant consequences of opium.

Victor Augagneur has found potassium bromide of service in certain syphilitic manifestations. Dysphonia or aphonia sometimes occurs, especially in women, in the sixth or seventh month of the disease. In the belief that it depends more upon disturbed innervation than upon the erythema of the laryngeal mucosa, he is accustomed to give bromide in combination with potassium iodide with very good results. In serious tertiary disease of the larynx the iodide may give rise to dyspnœa. In this condition it is advantageous to practise mercurial inunction and depend upon the bromide to reduce reflex excitability. When the dyspnœa has been allayed the bromide and iodide may be administered in association. The addition of the bromide to the iodide is also of value in cerebral syphilis.

According to Dr. Wilks, the bromides often have a good effect in causing reduction of goitre. They have also been used with success in order to diminish the volume of fibroid tumors of the womb.

During administration of the bromides, the digestive functions may become disordered and it is necessary to occasionally give cholagogue cathartics to keep the liver up to its work.

In comparing the bromides we observe some difference in their effect and therapeutic applications.

Potassium bromide is the most frequently prescribed, and is the most efficient. Where the circulation is weak the other salts, especially the ammonium salt, are to be preferred.

Sodium bromide is the least toxic, and is preferred in cases where nutrition is poor, especially in anæmic women and children. It is not so efficient in cases of a uric-acid diathesis or lithæmia, as other salts, and notably that of lithia.

Lithium bromide has been thought to possess more hypnotic power than the potassium bromide. Ammonium bromide combines the stimulating action of the ammonia with the hypnotic effect of bromine, and is useful in cerebral rheumatism. The manifestations of bromism are not so readily excited by the ammonium salt as by that of potassium or sodium. Ammonium bromideis useful in whooping-cough.

Nickel bromide, introduced by Da Costa for the treatment of epilepsy, has the advantage of the smallness of the dose, but the disadvantage of the metallic poisoning when too long continued. It is best given in effervescent salt or in the form of a syrup mixed with orange-flower water. The salt is green in color, deliquescent and soluble in water. It is well borne by the stomach, relieves congestive headaches and convulsive movements. Zinc bromide is little used; it is supposed to combine the well-known action of zinc upon the central nervous system with the bromide action. The syrup of ferrous bromide has been employed for chorea in anæmic children, with good results.

**Bromamide.**—Fischedick and Kœchling have introduced a compound of the aniline group containing 75 per cent. of bromine and designated by them as bromamide. It is obtained in the form of colorless, odorless and tasteless needle-shaped crystals, insoluble in water but soluble in boiling alcohol, ether, chloroform and the fixed oils. It melts at 243° F. and volatilizes at 310° F. without change. No symptoms are produced in dogs by doses of 30 grains. The pulse-rate is, in adults, retarded by a dose of 10 grains. Bromamide reduces a febrile temperature 1° to 2.5° F. without excessive sweating. It does not disorder digestion or produce diuresis. This substance has been employed as an antipyretic and antineuralgic in doses of 10 to 15 grains several times a day to adults and 1 to 5 grains to children. Bromamide may be administered in capsules and wafers or suspended in a fluid.

**Bromoform—Tribromo-Methane.**—If to methane, or marsh-gas ($CH_4$), be added 3 atoms of bromine in substitution for 3 of hydrogen, we get methyl bromide, or bromoform ($CHBr_3$) analogous, therefore, in composition to chloroform or iodoform. Bromoform is an oily liquid, having an agreeable odor resembling that of chloroform. It has a sweet taste, does not affect the mucous membrane of the mouth and has no irritant effect. It is rapidly decomposed by light. Its density is 2.77 and it boils at 150° C. Insoluble in water, it dissolves in alcohol and ether, its reactions being similar to chloroform. It usually is present in small proportion in commercial bromine, and is made by adding bromine to a solution of an alkaline hydrate in alcohol or wood-spirit.

Bromoform was first introduced by Stepp, of Nuremberg, in 1889, as a valuable remedy in whooping-cough. In children aged from six months to one year, 2 minims may be given three or four times daily, and the dose is increased by about a drop for every additional year of age. The dose for adults is 0.5 to 0.8 gramme in capsules. Bromoform diminishes the frequency, severity, and duration of the paroxysms of pertussis, has a favorable influence upon the mucous secretion, and generally abolishes vomiting and the hæmorrhages within a short period. The most severe cases are perceptibly benefited within eight days. Dr. S. Solis-Cohen has used bromoform with beneficial results, as a local application, in the treatment of tuberculous and other ulcers of the throat. He recommends its combination with iodoform. The local application of bromoform is also of utility in ozæna.

Dr. Ponticaccia reports that bromoform, given in daily doses, progressively increasing from 15 to 50 drops, has an excellent sedative effect in cases of acute mania. He found the same remedy of value in delirium tremens, in which it allayed restlessness and induced sleep. Several cases of poisoning from bromoform have been reported, the patient in each case being a child who had taken a large quantity of the pure drug. Extreme collapse was the result, but the patients generally made good recoveries, under the use of restoratives. A fatal case was observed by Nauwelaers, the patient being a child fifteen months of age. The symptoms were: Profound depression of circulation and respiration, muscular relaxation, coldness, stupor, fixed and contracted pupils. There were found slight congestion of the brain, marked injection of the stomach and duodenum, and a great increase of the bronchial secretion.

When bromoform is given suspended in a gummy mixture accidents have happened through neglect of the caution to shake the bottle before pouring out the medicine. It is insoluble in dilute alcohol, but may be dissolved by the aid of glycerin, and a formula has been proposed by the late P. W. Bedford which forms a perfect and palatable solution. Each fluidrachm contains 1 minim of bromoform.

| | | | |
|---|---|---|---|
| ℞ | Bromoform, | | ♏xvj. |
| | Alcohol, | | |
| | Tr. cardam. co., | āā | fʒij. |
| | Glycerini, | | fʒjss. |
| M. | | | |

**Bromol, or Tribromphenol,** is obtained by the action of bromine in excess on carbolic acid. It possesses antiseptic properties, and has been used with advantage in the local treatment of wounds, ulcers and diphtheria. In the last-named affection Rademaker recommends a mixture of 1 part of bromol with 25 parts of glycerin. Bromol has been given internally in cholera infantum in doses from $\frac{1}{12}$ to $\frac{1}{4}$ grain. On the ground of his experimental and clinical investigations, Dr. Tschourilow states that bromphenol is an excellent application in erysipelas. He made use of it in the form of a 1, 2 or 3 per cent. ointment.

**Bromo-Gallic Acid.**—This substance, otherwise known as bromogallol, resembles bromic acid, in which two atoms of hydrogen have been replaced by bromine. The blood of a dog poisoned by bromogallol was of a saffron color and contained a large quantity of methæmoglobin. Respiration was at first accelerated but afterward retarded. Lépine and Cazeneuve, of Lyons, have employed it as a succedaneum of potassium bromide. It appeared to be useful in chorea, but less efficient in epilepsy than the salt of potassium. This preparation, known also as gallobromol, has been used with success locally in eczema rubrum and other stubborn forms of eczema in the form of a 1- to 2-per-cent. solution, powder or ointment. In cystitis and epididymitis 2- to 4-per-cent. solutions have been employed by irrigation.

## **BRYONIA** (U. S. P.).—**Bryonia.**

### *Preparations.*

*Tinctura Bryoniæ* (U. S. P.). –Tincture of Bryonia. *Dose,* fʒi–iv.
*Extractum Bryonia Fluidum.*—Fluid Extract of Bryonia. *Dose,* ♏v–xv.
*Bryonin.*—The active principle. *Dose,* gr. $\frac{1}{6}$–$\frac{1}{3}$.

**Pharmacology.**—Bryonia alba and Bryonia dioica (Cucurbitaceæ) are the official sources of the root known as Bryonia, which must be recently dried, as an old drug is useless; the green root is preferred by some as being most active. **Bryonin,** a glucoside, is the principal constituent; it appears in pearly crystals or in white powder; it is very bitter; soluble in water and alcohol. On being boiled with diluted sulphuric acid, bryonin splits up into glucose and a resin, bryogenin. A second resinous principle, bryoresin, is also found in the root.

**Physiological Action.**—The juice of the fresh plant blisters the skin. The drug, taken internally, acts as an irritant, and is a drastic purgative. It also increases the flow of urine. Bryonia is said to produce an irritant effect upon serous membranes and in toxic doses to give rise to symptoms of meningitis.

**Therapy.**—As there are better purgatives, bryonia is not required for this purpose. It is reported to have been used with success in atonic dyspepsia. It is used, in small doses, in rheumatism, pleurisy, and other serious inflammations, after the fever has abated. It appears to be especially serviceable in the muscular pains and stiffness following colds. In chronic bronchitis it has been advocated. Bryonia has been recommended in the catarrhal stage of whooping-cough and in cases of enlarged spleen from chronic malaria, and, also, by Petresco, in cases of hæmorrhage, especially in epistaxis.

## **BUCHU** (U. S. P.).—**Buchu.**

### *Preparations.*

*Extractum Buchu Fluidum* (U. S. P.).—Fluid Extract of Buchu. *Dose,* ♏x–fʒj.
*Infusum Buchu.*—Infusion of Buchu. *Dose,* f℥ij.

**Pharmacology.**—The leaves of Barosma betulina, and B. crenulata (Rutaceæ)—derived from Southern Africa. They contain a volatile oil, which is the most active constituent. They also contain mucilage. A camphoraceous substance, barosma camphor, is deposited from the oil, in the cold. The recent infusion is made in the strength of one ounce to the pint. The fluid extract alcohol does not mix readily with water, on account of the presence of the oil and extractives.

**Physiological Action.**—Buchu-leaves have a strong, mint-like odor and a bitter, pungent taste. When taken into the stomach a warming, carminative effect is produced by small doses, but very large ones cause irritation. The volatile oil diffuses into the blood, slightly stimulating the circulation, and especially acting upon the kidneys, increasing the quantity of the urine (both fluid and solid constituents being increased), and imparting to it a peculiar, aromatic odor. In process of excretion the remedy acts as an astringent and disinfectant upon the urinary organs, especially the bladder. As a portion is eliminated by the bronchial mucous membrane, a stimulating influence is also exerted here in relaxed conditions accompanied by increased secretions. When used to excess or for a long period, the kidneys suffer and degenerative or inflammatory conditions are initiated.

**Therapy.**—The principal use of this agent is for disorders of catarrhal character affecting mucous membranes and diseases of the genito-urinary organs particularly. In incontinence of urine, or want of tone in the bladder, good results follow its administration. Buchu affords relief in irritability of the bladder, subacute or chronic cystitis and pyelitis. Through the enterprise of the owners of proprietary remedies, buchu has a popular reputation for the cure of gonorrhœa, but, owing to the quantity of alcohol contained in the fluid extract, it is not to be used during the existence of inflammation, and only with great care in chronic urethritis or gleet.

There are many good reasons for believing that the much-advertised "buchu cures" for gonorrhœa contain no buchu-leaves whatever, but are made from the leaves of uva ursi and other domestic plants. In fact, buchu resembles oil of turpentine very much in its physiological effects and is useful in much the same class of cases. In gleet, buchu is highly serviceable. Buchu has been used with success in chronic bronchitis, atonic dyspepsia, lithæmia, and in chronic rheumatism it is said to be sometimes of advantage.

### BURSA PASTORIS.—Shepherd's Purse.

**Pharmacology and Therapy.**—Shepherd's Purse is a small plant belonging to the Cruciferæ, a native of Europe, but growing luxuriantly in this country in cultivated lands during the months of April and May. The plant has a bitter, astringent and strongly pungent taste. It contains a volatile oil, resembling oil of mustard, a glucoside, bitter principle, resin, etc.

According to Von Oefele, the virtues of the plant depend upon the presence of bursinic acid, the salts of which, with iron and sodium, may be given in 1½-grain doses several times a day. Of the tincture, made with fresh leaves, the dose is ♏x–fʒj to fʒiv, given in cases of hæmorrhage from the lungs, kidneys, or uterus, and also in diarrhœa and dysentery. A fluid extract is also made, the dose of which is from 30 minims to a drachm. Both preparations are miscible with water without precipitation.

### CACTUS.—Cactus. (Night-blooming Cereus.)

**Pharmacology and Therapy.**—The Cereus grandifloris (Cactaceæ) is a plant of Mexico, with large, showy, nocturnal-blooming flowers, of pearl-white petals, which have a heavy perfume. A tincture of the fresh stems and flowers (℥iv–Oj alcohol) is claimed by Rubini to be a valuable cardiac tonic in doses of ♏i–v, three times a day. Probably these doses might be much increased, as Kunge gave ♏xx at once, and H. C. Wood was unable to perceive any effect from them at all. A difference might be accounted for on the ground that some use the fresh plant and others the flowers and leaves recently dried, the latter being the stronger preparation. Gregory claims that cactus increases the contractile power of the heart-muscle, regulates its rhythm, and improves its nutrition. It is claimed to be free from the unpleasant effect of digitalis. Boinet and Boy-Teissier determined that in frogs cactus increases cardiac energy, but that the effect is transitory. Dr. Reynold W. Wilcox states that the physiological action of cactus is upon the intra-cardiac ganglia and accelerator nerves, through the cardiac plexus of the sympathetic system, and that there is no interference with the inhibitory nerves, nor does its administration produce any very marked vaso-motor changes. It shortens the ventricular systole and increases the blood-pressure. Sultan has extracted an active principle, which he terms cactin, from the young flowers of the plant. He states that cactin increases the energy of the cardiac contractions, heightens arterial tension, and has a direct action upon the motor centres of the spinal cord. It produces reflexes, increases the general nervous tone, and can be used for a long period without causing gastric symptoms or cumulative effects. Both pulse and blood-pressure are reduced by toxic amounts. The action of the heart is rendered irregular and it is arrested in systole. Death is preceded by clonic and tetanic convulsions caused by overstimulation of the motor tract of the cord. Dr. Wilcox found it especially useful in uncompensated cases of valvular disease, in relative incompetency due to muscular degeneration, in weak hearts after typhoid fever, in functional heart diseases from alcohol, dyspepsia, sexual exhaustion, etc., and in the palpitation of exophthalmic goitre. In aortic regurgitation he considers it to be the drug, *par excellence*, while in mitral stenosis it should be avoided. Watson Williams has found cactus beneficial in mild cases of angina pectoris. Cactus has also proved itself efficient in cardiac dropsy.

## CADMIUM.—Cadmium.

### *Preparations.*

*Cadmii Sulphas.*—Cadmium Sulphate. Local use.

*Cadmii Iodidi.*—Cadmium Iodide (containing about 70 per cent. of iodide).

*Cadmii Iodidi Unguentum.*—Ointment of the Cadmium Iodide (ʒi–℥j lard). Does not discolor the skin.

*Cadmii Oleas.*—Oleate of Cadmium. See Oleates.

**Pharmacology and Therapy.**—Cadmium is usually found combined with zinc in the ores. It resembles tin in general appearance, and its salts are white and permanent; they are soluble in water. They are astringent and resemble the corresponding zinc salts, producing emesis, but they are principally employed for their local effects. Small doses of the salts of cadmium excite, whether given by the mouth or hypodermic injection, inflammation of the gastro-intestinal mucous membrane and ulceration may occur. In addition they may cause giddiness, loss of consciousness, retardation of the circulation and respiration. Alkaline carbonates and white of egg are the proper antidotes. The ointment of the iodide, or the oleate, may be used in chronic enlargement of glands or joints, and especially in goitre. It has also been recommended as an application in cases of enlarged spleen. Lincke has made use of injections of cadmium sulphate in leucorrhœa and gonorrhœa. The sulphate may be employed as an astringent wash (in solutions gr. ii–℥j), or as an ointment (1–40 benzoinated lard). The solution of the sulphate is used as a collyrium.

**CAFFEINA** (U. S. P.).—**Caffeine.** See also Coffea.
**Dose,** gr. ii–x.

*Preparations.*

*Caffeina Citrata.*—Citrated Caffeine. *Dose,* gr. i–v.
*Caffeina Citrata Effervescens.*—Effervescent Citrated Caffeine. *Dose,* ʒi–iij.
*Caffeina Sodio-Benzoas.*—Sodio-Benzoate of Caffeine. *Dose,* gr. ii–x.
*Caffeina Sodio-Salicylas.*—Sodio-Salicylate of Caffeine. *Dose,* gr. ii–x.

**Pharmacology.**—Caffeine is a proximate principle of feebly-alkaloidal power, generally prepared from the dried leaves of Thea Sinensis (Ternstromiaceæ), or from the dried seeds of Coffea Arabica (Rubiaceæ), and occurring also in other plants. Paraguay tea, or maté, the Brazilian holly (Ilex Paraguensis), also contains caffeine, and is largely used as a hot beverage and stimulant in South America. It exists also in the kola-nut of Africa, the fruit of Sterculia acuminata (Sterculiaceæ). It is closely related to theobromine, existing in theobroma cacao, and to cocaine, found in erythroxylon coca, both in chemical composition and effects upon the human body.

Citrated Caffeine is most frequently employed in medicine on account of its greater solubility, but Tanret has recently shown that by the addition of an equal weight of sodium salicylate or benzoate the solubility of caffeine is greatly increased. Antipyrin has also been found to have the same action; so that by this means the hypodermic administration is greatly facilitated. Twenty-four grains of antipyrin will enable 15 grains of caffeine to dissolve in 1 ounce of distilled water, with the aid of heat, forming a permanently limpid solution.

Caffeine is in the form of colorless, silky, inodorless crystals, sparingly soluble in alcohol and cold water (75 parts), but much more soluble in boiling water (9.5 parts). It is precipitated from its aqueous solution by tannic acid, or solution of potassium iodide and mercury; with the latter reagent the deposit is crystalline, whereas, with other alkaloids, the product is always amorphous when this test is employed. Caffeine was first extracted from coffee in 1821, by Pelletier and Caventou, and by Robiquet and Runge. According to Wurtz, it exists in coffee, tea, maté, and guarana, and chemically is methyl-theobromine (or trimethyl-xanthine). The caffeine of commerce is usually made from damaged tea.

**Physiological Action.**—Recently, it has been claimed by Dr. Mays that the physiological effects of the alkaloid obtained from coffee differ from those following the administration of caffeine from tea. It has been held that the well-known differences in the physiological effects of tea and coffee were due to other constituents, and especially to volatile oils, and in the ordinary method of manufacture these might still contaminate the caffeine. It has been shown that tea contains another base, theophylline (Rossel, *Zeitschrift für Physiologische Chemie*), isomeric, but not identical with theobromine and paraxanthine. The presence of this base might also affect the physiological results. The experiments of Dunstan and Shepheard demonstrate that caffeine and theine are identical in chemical properties. Mays claims that theine possesses analgesic properties which are absent in caffeine; and that the latter will not affect the heart, while the former causes palpitation. Theine, injected hypodermically, produces local anæsthesia, whereas pure caffeine will not affect sensibility. Tanret and Fauvel, on the contrary, regard caffeine as an efficient local anæsthetic. Investigations with ordinary caffeine (theine) prove it to have very decided physiological powers. There is, after its administration, at first increase, but later diminution, of the activity of the reflex centres of the spinal cord. In frogs, convulsions and muscular rigidity are caused; the heart's action is at first accelerated and afterward slowed. Arterial pressure at first rises, but subsequently falls. Caffeine stimulates the vaso-motor centre and exerts a direct influence upon the heart. It assists the system to resist hunger and fatigue. It has a decided diuretic action. The excretion of urea is at first increased, afterward diminished. Administered medicinally, the rate of respiration is reduced, blood-pressure lowered; temperature slightly increased, afterward diminished. The cerebral functions are stimulated, and, in some persons, wakefulness results. Delirium, alone or associated with visual hallucinations, is sometimes excited by the administration of caffeine. It counteracts the effects of narcotic remedies, and is valuable in the treatment of opium poisoning, although not a complete antidote. When taken into the stomach, caffeine diffuses readily into the blood, and is eliminated by the kidneys and the liver, principally. Small doses increase the appetite and facilitate digestion; there is some irritation of the digestive tract, increasing peristalsis and in some cases causing venous congestion and hæmorrhoids. From a dose of 12 grains of caffeine, Dr. Pratt experienced restlessness, sleeplessness, mental depression, and tremor. A dessertspoonful of the citrate produced nausea, stupor, extreme pallor and debility, soft pulse, slow and sighing respiration; but recovery followed the use of emetics, hot applications, and brandy.

**Therapy.**—In migraine, caffeine citrate may be administered, 1 grain every hour, with excellent effect; or a cup of strong tea or coffee given. Where there is co-existing liver, kidney, or stomach disorder, this should also receive attention. Hemicrania may be relieved by the administration of caffeine, and the hypodermatic injection of this agent is sometimes efficient in neuralgia; or, it may be administered as follows:

℞ Caffeinæ citrat., . . . . . . . . . gr. xx.
Phenacetin.,
Pulv. aromatic., . . . . . . . . āā ʒss.
M. et ft. chartæ no. x.

Sig.: A powder every two or three hours. Serviceable in migraine, and in neuralgia about the scalp, face and in sciatica.

℞ Caffeinæ citrat, . . . . . . . . . gr. xx.
Acetanilid., . . . . . . . . . . gr. l.
Ext. cannabis Indicæ, . . . . . . . . gr. iij.
M. et ft. capsulæ. no. x,
Sig.: A capsule every two or three hours for neuralgia.

℞ Caffeinæ citrat., . . . . . . . . . . ʒss.
Ammonii bromidi, . . . . . . . . . ʒiij.
Elix. guaranæ, . . . . . . . . . . f℥ij.
M. Sig.: A teaspoonful every hour or two until relieved of pain of neuralgia.

In despondency and hypochondriasis it will sometimes serve a good purpose. It may be given in order to dissipate the drowsiness which is often produced by a hearty dinner.

As a cardiac stimulant in valvular diseases, dilated or fatty heart, or in the myocarditis accompanying rheumatism, in low fevers, and in dropsy due to weak heart, caffeine may be given hypodermically (gr. i–ij every two to four hours), or the sodio-benzoate may be employed as recommended by Huchard. When being administered in these cases caffeine will sometimes give rise to so much insomnia that its use will have to be abandoned or, at least, temporarily suspended. Dr. Petrescu, of Bucharest, indeed, claims advantage from largely increasing the usual doses, and states that he has administered with good effect as high as 30 to 60 grains daily for several consecutive days. Misrachi recommends the use of the sodio-benzoate in puerperal hæmorrhage and states that when given hypodermically it acts more rapidly than ergot. In chronic Bright's disease caffeine diminishes albuminuria and dropsy. It may be used in co-operation with hydragogue cathartics in ascites. Uræmic coma may sometimes be lightened by the hypodermic administration of caffeine. The hypodermic injection of caffeine is of assistance in the treatment of opium poisoning. It may be used during the intervals of administration of digitalis, or, where this drug is too slow, given in the following combinations :—

| | |
|---|---|
| ℞ Caffeinæ citrat., | gr. l. |
| Liquor. potassii citratis, | |
| Spiritus ætheris nitrosi, | |
| Infus. digitalis, | āā f℥ij. |

M. Sig.: A half a teaspoonful in water every three or four hours. Employ in valvular insufficiency, attended with dropsy.

In weak, dilated heart, with gouty tendency, and in nephritis, the following are useful :—

| | |
|---|---|
| ℞ Caffeinæ citrat., | |
| Lithii citratis, | āā gr. c. |
| Strychninæ sulphat., | gr. ¼. |
| Ol. gaultheriæ, | ♏v. |

M. et ft. capsulæ no. xx.
Sig.: One every four hours.

| | |
|---|---|
| ℞ Caffeinæ citrat., | gr. l. |
| Tinct. strophanthi, | ♏lxx. |
| Aquæ camphoræ, | f℥iij. |

M. Sig.: A teaspoonful three times a day. Use in parenchymatous nephritis attended with dropsy.

In pneumonia, or congestion of the lungs with weak heart, in elderly patients, caffeine is an excellent remedy in moderate doses (gr. i–ij, given every two to four hours). It is likewise of value in the weakened heart of typhoid fever and pneumonia, after the febrile stage has passed. In the diarrhœa of relaxation, typhoid fever, sporadic cholera, etc., the sodio-benzoate or sodio-salicylate may be used in combination with nux vomica or strychnine.

Cholera infantum and the diarrhœa of phthisis are not infrequently benefited by caffeine. An asthmatic paroxysm may often be relieved by this remedy. On account of its tendency to produce wakefulness it has, generally in the form of a strong coffee, long been a valuable adjuvant in the treatment of opium poisoning.

**Caffeine Tri-Iodide.**—This compound, a dark green crystalline substance, readily soluble in alcohol, is a stimulant and diuretic, which has been used in cardiac dropsy in the dose of 2 to 4 grains.

**Caffeine-Sulphonic Acid.**—This compound, introduced by Drs. Heinz and Liebrecht, is claimed to stimulate the secreting power of the kidneys without increasing blood-pressure. It has been given in the form of a sodium combination, and while acting as a good diuretic had no ill effect upon the digestive processes. The salt is, therefore, well adapted to the treatment of cardiac or renal dropsy. Caffeine-sulphonic acid will also unite with lithium, and it is thought that this salt will prove useful in lithiasis, gout and gravel.

## **CAJUPUTI OLEUM** (U. S. P.).—**Oil of Cajuput.**

**Dose,** ♏i–v.

**Pharmacology.**—The volatile oil of cajuput is of a green color, and has a camphoraceous odor and neutral reaction. It is distilled from the leaves of Melaleuca leucadendron (Myrtaceæ), a tree of the Moluccas.

**Physiological Action.**—Locally it is rubefacient, antispasmodic, and antiseptic. Internally it is carminative, diaphoretic and diuretic, and somewhat stimulating to the circulation.

**Therapy.**—Externally it has been used as a counter-irritant, usually diluted with sweet-oil, in myalgia and chilblains, and in various parasitic affections, such as tinea, pityriasis, eczema, scabies, etc. Delvaux states that he has found oil of cajuput to be an efficacious application in psoriasis and rosacea. It may also serviceably enter into the composition of a stimulating ointment for alopecia. This oil has been successfully used, suitably diluted with an emulsion, as an injection for ascarides or seat-worms. Diluted with glycerin or olive-oil it is a good local application in earache. A drop of oil of cajuput upon cotton placed within the cavity of a carious tooth relieves toothache. This remedy has also been given internally as a vermifuge.

The oil of cajuput has been used with advantage to relieve the prostration of typhoid fever. This remedy is of service in intestinal colic, cholera morbus, and nervous vomiting, and also relieves nervous dysphagia, hiccough and dyspnœa, and it is said to allay the pain of dysmenorrhœa. Its principal use internally is for its stomachic effects as an adjuvant to tonic remedies. It has been administered in comparatively larger doses (♏xv–lx) in the collapse stage of cholera, with good results. It is claimed to be useful in rheumatism and in various skin diseases. The oil of niaouli or miaouli, derived by distillation from the leaves of Melaleuca viridifloria, a large tree of New Caledonia, possesses properties very similar to those of the oil of cajuput. Niaouli oil is of a pale yellow color, has a taste which recalls that of peppermint, and is analogous in chemical composition to terpinol. It is insoluble in water, but soluble in alcohol, ether and benzene. Niaouli oil is well borne by the stomach and has been given in doses of 4 minims in emulsion or capsule. It is said to have an excellent effect in bronchitis, and in pulmonary tuberculosis it markedly diminishes the expectoration. Niaouli oil has also been used by Dr. Blanc in other conditions for which the oil of cajuput is given.

## CALAMUS (U. S. P.).—Calamus, Sweet Flag.

### *Preparation.*

*Extractum Calami Fluidum* (U. S. P.).—Fluid Extract of Calamus. *Dose*, ♏xv–fʒj.

**Pharmacology.**—The scraped and dried rhizome of Acorus calamus (Aroideæ) is slightly aromatic and quite pungent to the taste, and is carminative. It contains **Acorin**, a nitrogenous principle, a volatile oil, benzoic acid, etc.

**Therapy.**—In consequence of its feebly-aromatic taste, calamus is sometimes useful in overcoming a tendency to flatulence, by chewing it slowly and swallowing the saliva. It is used also as a substitute for tobacco by those accustomed to chewing the weed. It is a constituent in various "bitters" used as appetizers and stimulants. An infusion (℥i–Oj) may be administered in wineglassful doses as a stomachic tonic.

## CALCIUM.—Calcium.

### *Official Salts.*

*Calx* (U. S. P.).—Quicklime. Not used internally.

*Calx Chlorata* (U. S. P.).—Chlorinated Lime (available chlorine, 35 per cent.).

*Calx Sulphurata* (U. S. P.).—Sulphurated Lime (Crude Calcium sulphide). A mixture of Calcium Sulphide and Sulphate. *Dose*, gr. $\frac{1}{4}$-ij.

*Calcii Chloridum* (U. S. P.). - Calcium Chloride. *Dose*, gr. i–xx.

*Calcii Hypophosphis* (U. S. P.).—Calcium hypophosphite. *Dose*, gr. x–xx.

*Calcii Bromidum* (U. S. P.).—Calcium Bromide. *Dose*, gr. x–xxx.

*Calcii Carbonas Precipitatus* (U. S. P.).—Precipitated Calcium Carbonate. *Dose*, gr. x–xl.

*Calcii Phosphas Precipitatus* (U. S. P.).—Precipitated Calcium Phosphate. *Dose*, gr. x–xxx.

*Creta Preparata* (U. S. P.).—Prepared Chalk. *Dose*, gr. x–xx.

### *Preparations.*

*Syrupuus Calcii Lactophosphatis* (U. S. P.).—Syrup of Calcium Lactophosphate, *Dose*, fʒi-ij.

*Syrupus Calcis* (U. S. P.).—Syrup of Lime. *Dose*, fʒss-j.

*Syrupus Hypophosphitum* (U. S. P.).—Syrup of the Hypophosphites (calcium, gr. iij ; potassium, gr. j ; sodium, gr. j ; in fʒj). *Dose*, fʒss–ij.

*Syrupus Hypophosphitum cum Ferro* (U. S. P.).—Syrup of the Hypophosphites with Iron. *Dose*, fʒi–ij.

*Hydrargyrum cum Creta* (U. S. P.).—Mercury with Chalk (mercury 38, chalk 57, clarified honey, 10 parts). *Dose*, gr. i–xx.

*Trochisci Cretæ* (U. S. P.).—Troches of Chalk (prepared chalk, 4 grs. each). *Dose*, 1 or more.

*Pulvis Cretæ Compositus* (U. S. P.).—Compound Chalk-Powder (prepared chalk 30, acacia 20, sugar 50 parts). *Dose*, gr. v–xxx.

*Mistura Cretæ* (U. S. P.).—Chalk Mixture (compound chalk-powder, cinnamon-water and water). *Dose*, f℥i–iv.

*Liquor Calcis* (U. S. P.).—Solution of Lime or Lime-Water. *Dose*, f℥ss–ij.

*Linimentum Calcis* (U. S. P.).—Lime Liniment (equal parts lime-water and linseed-oil).

*Potassa cum Calce* (U. S. P.).—Potassa with Lime. Vienna or Caustic Paste (equal parts caustic potassa and lime).

*Testa Preparata.*—Prepared Oyster-Shell. *Dose*, gr. v–xx.

*Liquor Calcis Chloratæ.*—Solution of Chlorinated Lime (13 grains of available chlorine in each ounce). A disinfectant.

*Lotio Hydrargyri Nigra.*—Black Wash (calomel, gr. xxx ; lime-water, f℥x).

*Lotio Hydrargyri Flava.*—Yellow Wash (corrosive sublimate, gr. xviij ; lime-water, f℥x).

*Pulvis Cretæ Aromaticus cum Opio.*—A mixture of Aromatics with Chalk, containing 1 grain of opium in 40. *Dose,* gr. x–xx.

*Calcii Carbolas.*—Calcium Carbolate. Used as a disinfectant

**Pharmacology.**—Lime is the oxide of a metallic element, calcium, which, like potassium and sodium, decomposes water at ordinary temperatures. Calcium oxide, when fresh from the lime-kilns, is in large, hard, grayish masses, constituting what is known as quicklime, which has a great affinity for water, even taking it from the air. Under the influence of moisture, lime generates heat and breaks up into a wet powder, which is a mixture of calcium oxide and calcium carbonates, and constitutes slaked lime. Calcium oxide is more soluble in cold than in hot water. Chalk, or calcium carbonate, is a valuable antidote in cases of poisoning by carbolic, sulphuric, or oxalic acids. It is found in the household in tooth-powder, convenient for prompt administration.

**Physiological Action.**—Some preparations of lime are sedative, others astringent or caustic; quicklime is irritating and caustic to mucous membranes. Lime-water and chalk are astringent and alkaline; they reduce the acidity of the contents of the alimentary canal, thus relieving irritation, and also exert a slightly astringent effect. In patients suffering from deficiency of lime in the food, lime-water is a useful and acceptable remedy, and may be continued for a long time. Calcium phosphate serves an important function in promoting the nutrition of the motor apparatus,—bone, cartilage, tendon and muscle. The presence of a certain proportion of lime salts in the blood is essential to general nutrition. When this amount is reduced disturbances arise, affecting particularly the bony and lymphatic glandular systems. Calcium chloride is more of an irritant; it has a reputation for its influence as an alterative in strumous patients. Vienna paste is used in surgery as a caustic. According to the investigations of M. Binet, the salts of the alkaline earths are capable of causing respiratory and cardiac troubles, from which death may directly ensue. They may also cause derangement of the gastro-intestinal system. Eventually they may occasion loss of nervous excitability and muscular contractility. Toxic doses of calcium arrest the heart in systole. Calcium exerts a special action upon the nervous system, occasioning a condition of torpor with preservation of reflex excitability and sensibility.

**Therapy.**—Lime is an ingredient in depilatory powders, which are now superseded by the process of removal of hair by electrolysis. Freshly-slaked lime absorbs the products of decomposition, and is used as a disinfectant in cess-pools, manure-heaps, etc.; but the chlorinated lime, which prevents decomposition by virtue of the available chlorine, is far better. In the treatment of onychia maligna Professor Vanzetti recommends the application of caustic lime. Lime-water is a stimulating dressing for wounds and ulcers, and, combined with oil, is used as a dressing for burns. Carron-oil consists of linseed-oil and lime-water. It is suggested that the addition of ½ to 1 per cent. of thymol augments the value of carron-oil by rendering it an antiseptic application. A better dressing is made by beating up lard (unsalted) with lime-water and adding a few drops of oil of bitter almonds. A very good prescription to use in burns will be:—

℞ Calcis præcip., . . . . . . . . . . ʒj.
Acidi carbolici, . . . . . . . . . . ℥ss.
Ol olivæ,
Aquæ calcis, . . . . . . . . . . āā f℥v.—M.

Carron-oil also relieves pain caused by the stings of wasps and other insects. According to Dr. Joseph Bell, applied to the face on a mask of cotton-wool it will decidly diminish the pitting in small-pox.

Lime-water is of undoubted value alone, or combined with glycerin, in the treatment of acute vesicular eczema. It may be employed for this as well as other varieties of eczema, especially when the surface is dry and irritable, with very great relief. Pruritus, which often becomes intolerable in eczema and other inflammatory affections of the skin, and itching present in old persons, may be relieved or cured by the application of lime-water, with rose-water, glycerin, or one of the oils. A very suitable application in the diseases just referred to is;—

℞ Liquor. calcis, . . . . . . . . . . f℥iij.
Creosoti, . . . . . . . . . . ♏x.
Pulveris zinci carb. (impur.), . . . . . . ℥j.
Glycerini vel ol. olivæ, . . . . . . . . f℥iij.
M. Sig.: Shake well and mop over the surface.

For the relief of pruritus ani, Dr. A. L. Berger advises the use of a pledget of cotton-wool soaked in the solution of chlorinated lime and introduced into the bowel. In seborrhœa, hyperidrosis, bromidrosis, and in bruises of the skin and deeper structures, the preparations of calcium, especially lime-water, are often used with great benefit. The following are excellent combinations:—

℞ Calcis præcip., . . . . . . . . . . ℥j.
Liq. boroglyceridæ (50 per cent.), . . . . . . f℥ss.
M. Sig.: Smear over the parts bruised.

℞ Calcii chloridi,
Calcis præcip.,
Pulv. amyli, . . . . . . . . . . āā ℥j.
M. Sig.: Dust over the surface, especially in oily conditions of the skin and in excessive and fetid perspiration.

Prepared chalk is employed very largely, alone as well as an ingredient of many very good dentifrices, on account of its antacid, astringent, and sedative action upon the gums and the mucous membrane of the buccal cavity. Garretson recommends the appended formula as being a good tooth-powder:—

℞ Cretæ prepar.,
Pulv. iridis flor., . . . . . . . . āā ℥ss.
Pulv. ossis sepiæ, . . . . . . . . . ʒij.
Olei limonis, . . . . . . . . . . q. s.—M.

Prepared chalk is a good dusting-powder in intertrigo and hyperidrosis and may be used upon the surface of ulcers as a protective dressing.

The preparations of calcium are especially useful in childhood because of the deficiency of lime in the food of many children. Lime-water added to milk gives material for bones and teeth, improves nutrition, and overcomes a tendency to rickets. It relieves irritability of the stomach and vomiting.

The syrup of lime contains more of the base than the solution, and is a convenient antidote to poisoning by oxalic, sulphuric, and other mineral acids. In children's diarrhœa, often due to sour stomach, chalk mixture is very useful, and may be combined with an antiseptic and opiate:—

| | |
|---|---|
| ℞ Creosoti, | ♏iv. |
| Tinct. opii camph., | fʒj. |
| Mist. cretæ, q. s. ad | f℥ij. |

M. Sig.: A teaspoonful every two hours in a child two years old.

The same mixture is useful in adults, with corresponding increase of dose and the addition of a decided astringent, such as tincture of kino, or fluid extract of coto-bark.

Other very effective prescriptions containing lime are:—

| | |
|---|---|
| ℞ Calcii carbonatis precipitati, | ʒiij. |
| Tincturæ catechu, | f℥j. |
| Tincturæ opii, | fʒij. |
| Spiritus chloroformi, | fʒiv. |
| Pulveris acaciæ, | ʒij. |
| Aquæ menth. pip., | f℥viss. |

M. Sig.: One or two teaspoonfuls in water every hour or two, for acute diarrhœa.

| | |
|---|---|
| ℞ Liquor. calcis, | |
| Ext. coto corticis fl., | |
| Syrup. acaciæ, | āā f℥j. |

M. Sig.: From one to two teaspoonfuls in water or milk every three or four hours, for chronic diarrhœa.

**Special Applications.**—In very young children, lime-water alone is sufficient, where the motions are too frequent and watery, and acid in their reaction. It is also used per enema against thread-worms, and it may be given as an injection in leucorrhœa. In diphtheria, much relief is experienced from the use of a spray of lime-water, preferably with the steam-atomizer, directed to the fauces, or from inhaling the vapors from slaking lime; it is claimed that the lime loosens the false membrane and partially dissolves it. It is also useful in the same manner in croup and plastic bronchitis. The vapor obtained from chlorinated lime is advantageously inhaled in hay fever. In adults, where it is desirable to administer milk, it is often found necessary to add lime-water to it to prevent curdling. In the artificial feeding of infants the addition of lime-water to cow's milk is of decided service by rendering the curd more soft and flaky, and consequently more easy of digestion. Milk and lime-water will not infrequently relieve gastralgia, and even, in some instances, the pain of gastric carcinoma. In the latter affection it also allays the vomiting. The prolonged administration of lime-water renders the urine alkaline, and hence it may prove useful in lithiasis. It has been shown that, under the same circumstances, carbamic acid may appear in the urine. The acid is united to the lime and causes the fluid to emit an ammoniacal odor. In combination with opium and aromatics, as in the pulvis cretæ aromaticus cum opio of the British Pharmacopœia, chalk is of great value in diarrhœa. The carbonate of calcium is likewise beneficial in diarrhœa, and, finely powdered, is a good application in intertrigo and acute eczema. Calcium phosphate is useful in rickets; also in anæmia, general debility, diarrhœa, in small doses, given frequently; it appears to have a stimulating effect upon the liver, and should be given in preference to mercury to infants with clay-colored stools, and in jaundice. The anæmia due to profuse suppuration, or to lactation, may be remedied by the administration of this salt. It is advantageous, moreover, in mollities ossium, delayed union of fractured bone, caries and necrosis, and scrofulous inflammation of the lymphatic glands. The hydrated phosphate has been warmly recommended as relieving the sickness of pregnancy. Calcium chloride allays vomiting produced by the presence of sarcinæ ventriculi.

Calx sulphurata is useful in styes, acne, and furuncles; given in gr. $\frac{1}{4}$–$\frac{1}{2}$ doses several times a day, it hastens maturation of pustules. If given early, it prevents the formation of pus, but if suppuration has occurred calcium sulphide limits its extent and favors early and complete evacuation. This combination is serviceable in both acute and chronic eczema. It is likewise beneficial in the suppuration of scrofulous glands. Dr. Frank P. Norbury finds it useful in acute tonsillitis, especially of strumous patients, with a tendency toward rapid suppuration. It prevents or limits the formation of pus. Dr. Witherle, of St. Paul, states that the calcium sulphide is beneficial in the early stage of pulmonary tuberculosis, given in doses as large as can be tolerated. The swelling of the upper lip and tip of the nose so often seen in scrofulous children may be decidedly improved by the exhibition, night and morning, of $\frac{1}{4}$-grain doses of calcium sulphide. In diphtheria, during the period when the membrane is loosening and suppuration is taking place, Phillips recommends the administration of this salt in doses of $\frac{1}{6}$ to $\frac{1}{4}$ grain every hour or every two hours. A case of elephantiasis has been reported in which this salt was successfully employed.

It is given with good effects in ophthalmia and sores in scrofulous children. Calx sulphurata is the official equivalent of calcium sulphide, which has been used in conjunction with defervescents by Dr. T. M. Lloyd, of Brooklyn, N. Y., in measles and scarlatina with the apparent result of abridging the course of the fever. In pertussis the same remedy reduced the number and severity of paroxysms. It was administered in doses of $\frac{1}{2}$ grain half-hourly to children between two and five years of age. Rubbed up with sugar of milk it was taken without repugnance. This salt will occasionally produce an eruption of vesicles, pustules and furuncles. Calcium chloride (not calx chlorata) is given, well diluted, in glandular enlargements, and is said to be curative in eczema and lupus; it is claimed that it aids cicatrization in tubercular ulcerations, and is useful in chorea and colliquative diarrhœas in strumous children.

Dr. Crombie, of the East Indian medical service, has found calcium chloride efficacious in the treatment of boils and pneumonia. Dr. A. E. Wright has ascertained by experiment that the addition of calcium chloride to blood renders coagulation more rapid. He has given the salt internally with advantage in a case of hæmophilia, and suggests that it will prove useful in the treatment of internal hæmorrhage and aneurism. He has known it to arrest an obstinately recurring epistaxis and a severe case of hæmoptysis. The same writer has prepared a "physiological styptic" by adding 1 per cent of calcium chloride to the fibrin obtained by whipping freshly-drawn blood. This preparation occasions prompt coagulation and occlusion of wounds.

Dr. S. Solis-Cohen prefers the calcium chloride to any other drug in the treatment of hæmoptysis, administering it in doses of 10 to 15 grains every second hour in glycerin, simple elixir and water, or infusion of gentian. Dr. Saundby has employed the same salt with success in purpura hæmorrhagica, administering 6 grains every two hours during the day. Sir J. Sawyer has employed the chloride in chronic pulmonary tuberculosis with good results, and states that in addition to its other advantages it will often suppress night-sweats. Both the chloride and the carbonate have been serviceably given in order to restrain hæmorrhage caused by a fibroid tumor, and to check menorrhagia.

Calcium hypophosphite has a special reputation for the treatment of phthisis, and is a useful tonic in such cases. The compound syrup of the hypophosphites with iron or strychnine, in appropriate cases, is one of the best general systemic tonics that we possess, especially when prescribed as follows:—

| | |
|---|---|
| ℞ Syrup. hypophosphitum comp., | f℥iv. |
| Syrup. ferri lactatis, | f℥iv. |
| Strychninæ sulphatis, | gr. ¼. |

M. Sig.: A half-tablespoonful in water three times a day.

Calcium bromide was brought forward (by Hammond) as a substitute for the potassium salt in cases where the depressing effects of the latter would forbid its use, such as epilepsy or chorea, in anæmic subjects (in doses of fʒss–ij), but it is seldom used. Professor Germain Sée regards both the bromide and chloride as advantageous in the treatment of dyspepsia and many diseased conditions of the stomach. This salt would, however, seem well adapted to fulfill the indications of a bromide in rachitic subjects. The bromide is said to contain one-sixth more bromine than the potassium bromide. Hugh Woods prefers the calcium oxyiodides to the other iodine preparations, as containing more iodine. According to the testimony of Dr. Beebe, who is corroborated by Dr. Lawrence, the calcium iodide is of service in membranous croup. These writers advise that $\frac{1}{6}$ to $\frac{1}{3}$ grain, dissolved in water, should be given every fifteen, thirty or sixty minutes, according to the severity of the symptoms. The syrup of calcium lactophosphate (made by dissolving calcium phosphate in lactic acid, with orange-flower water and syrup) is a pleasant and very useful remedy for improving nutrition in young children, especially if there be a scrofulous taint. It contains about 12 grains of calcium phosphate in each ounce. It is also a valuable agent in treating many skin diseases due to malnutrition. This combination may be advantageously prescribed, in vesicular emphysema, chronic bronchitis, phthisis, debility, and wasting diseases, thus:—

| | |
|---|---|
| ℞ Syrup. calcis lactophosphatis, | f℥iij. |
| Olei gaultheriæ, | ♏xxx. |
| Pulveris acaciæ, | ʒj. |
| Liquor. pancreatici, | f℥j. |
| Olei morrhuæ, | f℥v. |

M. et ft. emulsio.
Sig.: A tablespoonful three times a day.

Dr. H. V. Knaggs ascribes valuable antispasmodic properties to calcium sulphite, in spasmodic diseases. He gives gr. $\frac{1}{20}$ to a child one year old suffering with convulsions from dentition, meningitis, and even acute tuberculosis. A saturated aqueous solution of the bisulphite is an excellent non-poisonous disinfectant. The preparations of chalk, if given in large doses for a considerable period of time, may form intestinal concretions. Calcium salicylate, a salt which is soluble in water, has been recommended as a remedy in diarrhœa, especially that of children. The dose is from 8 to 20 grains, and it is given either alone or combined with bismuth salicylate. It is a white, odorless and tasteless crystalline powder.

**Asaprol.**—A salt of calcium with naphthol and monosulphonic acid has, for convenience, been termed asaprol. It occurs as a white powder, very soluble in water and alcohol, and is destructive to many forms of bacteria. It is administered in daily doses of 30 grains, gradually increasing to 60 grains. Asaprol is incompatible with alkaline iodides, sulphates, and with most of the alkaline salts. Quinine and its salts are also incompatible with this compound. Asaprol reduces febrile temperature and augments the secretion of urine. This substance has rendered service in the treatment of influenza, gout, asthma, boils, carbuncles, tonsillitis, etc. Asaprol is of advantage in acute rheumatism and in chronic forms of the disease it is useful in relieving pain. It is useful, also, in atonic dyspepsia. This remedy has been employed as an antipyretic in typhoid fever and pneumonia and as an analgesic in sciatica, intercostal neuralgia and tic douloureux.

## CALENDULA (U. S. P.).—Marigold.

### *Preparation.*

*Tinctura Calendulæ* (U. S. P.).—Tincture of Calendula (20 per cent.). *Dose,* fʒss–j.

**Pharmacology and Therapy.**—The fresh flowering herb of Calendula officinalis (Compositæ) contains a volatile oil, an amorphous bitter principle, **Calendulin**, yellow coloring matter, etc. It is used as an emmenagogue and as a diaphoretic, in recent infusion. In the form of tincture, it is reputed to be tonic, antispasmodic, and alterative, and may be employed locally as a revulsive in sprains, bruises, or in superficial burns and scalds, resembling arnica in its applications, though less active.

## CALUMBA (U. S. P.).—Calumba.

**Dose,** gr. v–x.

### *Preparations.*

*Extractum Calumbæ Fluidum* (U. S. P.).—Fluid Extract of Calumba. *Dose,* ♏xv–xxx.

*Tinctura Calumbæ* (U. S. P.).—Tincture of Calumba. *Dose,* fʒi–ij.

*Extractum Calumbæ.*—Extract of Calumba. *Dose,* gr. ss–ij.

**Pharmacology.**—The root of Jateorrhiza palmata (Menispermaceæ) of Africa contains, among its constituents, berberine, calumbin, calumbic acid, and starch. It is free from tannin, and therefore its preparations may be combined with iron.

**Physiological Action and Therapy.**—In composition and physiological action, calumba resembles quassia and gentian, though lighter and more agreeable than some of the other remedies of this class, and more acceptable to the stomach. As a bitter tonic, calumba may be used during convalescence, or in atonic dyspepsia or other enfeebled constitutional conditions. It is believed to be somewhat sedative and antispasmodic; in cases where this quality is required it would be better to use the fluid extract or powder than the tincture. A small dose of the tincture or infusion of calumba will often relieve nausea and vomiting. Atonic diarrhœa is benefited by calumba. When the tincture is prescribed as an appetizer, the danger of forming the alcohol habit should be kept in mind:—

| | |
|---|---|
| ℞ Ext. calumbæ, . . . . . . . . . | gr. ij. |
| Sodii bicarb., . . . . . . . . . | gr. x. |
| Pulv. rhei, . . . . . . . . . . | gr. v. |
| Pulv. zingiberis, . . . . . . . . . | gr. x. |

M. et ft. capsulæ, mitte tales no. xxx.
Sig.: Take one before each solid meal, for weak digestion.

As a good carminative mixture Dr. Crutchfield prescribes:—

| | |
|---|---|
| ℞ Tr. calumbæ, . . . . . . . . . | fʒ iij. |
| Sp. ammon. aromat., . . . . . . . . . | fʒ jss. |
| Tr. cardam. co., . . . . . . . q. s. ad | f℥ iij. |

M. Dose: Tablespoonful in water as required.

Dr. Schultz has had very good results from the tincture of calumba in the treatment of gastric catarrh. Calumba has been especially recommended as a valuable tonic in convalescence from influenza.

**CAMBOGIA** (U. S. P.).—**Gamboge.**

**Dose**, gr. $\frac{1}{10}$–iij.

**Pharmacology.**—Gamboge is obtained from the Garcinia Hanburii (Guttiferæ), a tree of Siam. It is a gum-resin, consisting largely of gambogic acid (73 per cent.), and is partly soluble in alcohol and ether, and forms an emulsion with water. It has no official preparations, and is never administered by itself, but is a constituent of the compound cathartic pill (each pill containing gr. $\frac{1}{4}$ of gamboge).

**Physiological Action.**—Gamboge is not a systemic but a local irritating purgative. It is at first tasteless, but afterward produces an acrid taste, with increased secretion of saliva. In the intestinal tract, it has a drastic, hydragogue, cathartic effect. It stimulates the intestinal glands, but not the liver (Rutherford), and is also believed to have some power as a diuretic, as it imparts a bright-yellow color to the urine. It carries off the bile in the intestinal canal and prevents re-absorption. Large doses cause vomiting and gastro-enteritis.

**Therapy.**—Gamboge has no local effect beyond staining the skin. It was formerly used in cardiac dropsy to carry off large quantities of fluid and promote absorption, but the compound jalap-powder accomplishes this result more quickly, agreeably, and certainly. The compound cathartic pill is a good remedy for constipation and at the beginning of the treatment of malarial poisoning. In minute doses (gr. $\frac{1}{10}$ every hour or two) it is claimed that gamboge would afford much relief in flatulence and intestinal indigestion.

### CAMELLIA.—Tea.

*Preparations.*

*Extractum Camelliæ Fluidum.*—Fluid Extract of Camellia. *Dose,* ♏x–fʒj.

*Infusum Camelliæ.*—Infusion of Tea (prepared extemporaneously). *Dose,* f℥ii–vj.

**Pharmacology.**—The extemporaneously-prepared infusion of the dried leaves of Camellia thea (Ternstromeaceæ), or Chinese tea-plant, is now so widely used at the table as a beverage that it has given its name to the evening meal. It contains caffeine (or theine), theophylline (Rossel),* a volatile oil, tannin, etc. Green tea is made from the younger leaves, dried with a moderate heat, so as to retain their color (sometimes fraudulently colored with Prussian blue, turmeric, and copper), while the black tea is made of the older leaves, and contains more tannin.

**Physiological Action and Therapy.**—The effects of tea are not fully represented by caffeine; probably theophylline, which is isomeric with theobromine, and the volatile oil assist in producing its physiological action upon the system. It is an antidote to narcotic poisoning by virtue of its caffeine, and to antimony and many alkaloids on account of its tannin; it is also a physiological antidote to agents which depress nerve-function or the heart. In small doses (ʒi–ij) infused with boiling water, tea is an agreeable stimulant, removing a sense of fatigue and giving a feeling of well-being. It is useful in headache from overwork or worry, and will often relieve migraine. Tea is an accessory food, but, on account of its convenience, it often becomes the principal article of food for persons who think that they cannot spare time to prepare a full meal, or have not the appetite to eat it. In many cases of what has been called tea-drinkers' dyspepsia, in sewing women, it is found, upon inquiry, that the tea is drunk with every meal, and that very little food is taken with it except bread or hot biscuit. Such cases of debility, palpitation of the heart, anæmia, flatulence, anorexia, constipation, etc., are not really instances of "Theism," but cases of starvation, and require good food, sunlight, exercise, and tonics. Men who deal in tea, and constantly taste it, only exceptionally show symptoms of nerve-disorder ascribable to this cause; even then it may be due to idiosyncrasy, for persons have different degrees of susceptibility to the effects of tea. Some cannot use it at all; others are proof, apparently, against any ill effects. Many can drink black tea who cannot stand the effects of green tea. Strong green tea may embarrass digestion and give rise to constipation. Tea may also diminish the tendency to sleep and in people of highly nervous temperament may cause obstinate wakefulness. Ordinarily, the moderate use of tea relieves fatigue and disposes to mental cheerfulness.

The fluid extract of tea may be used with good effect in low fevers as a stimulant, and in typhoid pneumonia, in the same class of cases as mentioned under the head of **Caffeine.**

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* *Zeitschrift für Physiologische Chemie. Therapeutic Gazette,* March 15, 1890.

**CAMPHORA** (U. S. P.).—**Camphor.**
**Dose,** gr. i–ij.

*Preparations.*

*Oleum Camphoræ.*—Oil of Camphor. *Dose,* ♏i–iij.

*Aqua Camphoræ* (U. S. P.).—Camphor-Water (gr. iv–f℥j). *Dose,* fʒi–iv.

*Spiritus Camphoræ* (U. S. P.).—Spirit of Camphor (10 per cent.). *Dose,* ♏v–xx.

*Linimentum Camphoræ* (U. S. P.).—Camphor Liniment (camphor 20, cotton-seed-oil 80 parts). External use.

*Ceratum Camphoræ* (U. S. P.).—Camphor Cerate.

*Camphora Monobromata* (U. S. P.).—Monobromated Camphor. *Dose,* gr. i–v.

Camphor is also a constituent of soap-liniment, camphorated tincture of opium, liniment of belladonna, compound mustard-liniment, chloroform mixture, and of compound morphine-powder.

**Pharmacology.**—The camphor-tree, Cinnamomum camphora (Laurineæ), is a native of the East Indies and China; it contains a solid, volatile, fatty substance, or stearopten, which exists in all parts of the plant or crystallizes naturally in the wood and under the bark. As collected by natives, it is called crude camphor, which is purified in this country by sublimation. Camphor is in white, translucent, partly-crystalline masses, of penetrating, aromatic odor and a cool, acrid taste. It is lighter than water, in which it is very sparingly soluble, but is readily dissolved by alcohol and ethereal substances. Camphor is quite soluble in milk, which may often, therefore, be used as a convenient vehicle. It is easily ignited and burns with a smoky flame. With chloral hydrate, camphor combines when triturated (equal parts), forming an oily liquid. When three parts of camphor are rubbed with one part of crystallized carbolic acid, a clear liquid is formed. Camphor cannot be powdered by trituration alone, but can be when moistened with alcohol, chloroform, or ether.

**Physiological Action.**—When applied to the skin, camphor slightly irritates and reddens the surface, and probably diffuses through into the deeper structures, so as to exert a local sedative effect. In considerable doses, camphor causes vertigo and confusion of ideas, diaphoresis, delirium or stupor, followed by epileptiform convulsions and maniacal excitement. There is lowering of the reflex excitability of the spinal cord and muscular weakness. In some cases the first manifestation of its toxic action has been a sudden loss of consciousness with or without convulsions. Upon the circulation a stimulating effect is observed from small doses and the arterial tension is raised, but larger doses cause prostration and weakness of the heart's action. Camphor is antispasmodic, and is a valued sedative in allaying abnormal nervous excitability often encountered in women, especially in cases where opium disagrees or is undesirable. It is, in full doses, a sedative to the generative functions and allays pain attending menstruation. Poisoning has followed the use of a saturated solution in alcohol (Rubini's tincture, or so-called "mother-tincture"), which should not be used, as so small a quantity as 7 minims have produced poisonous effects. Toxic doses give rise to inflammation of the stomach. In cases of poisoning, if any of the drug remain in the stomach it should be removed by the stomach-tube, the patient allowed to drink cold water freely, magnesium sulphate (℥j) given, and the symptoms combated with arterial stimulants and hypodermic injections of morphine and atropine. Camphor is eliminated by the kidneys, lungs and sudoriparous glands.

**Therapy.**—Camphor is highly prized in the household, for headaches and various neuralgic pains, the spirit or "Eau Sedative" being applied upon a flannel bandage. It is also a common ingredient in popular liniments.

Camphor-chloral is used in neuralgia and myalgia as a rubefacient and anodyne. It dissolves morphine readily:—

℞ Morphinæ sulphat., . . . . . . . . gr. xx.
Camphor. chloral., . . . . . . . . ʒij.—M.
For local application to painful spots.

Cavazzani applies to chancroids with excellent results a mixture of five parts of chloral hydrate, three of camphor and 25 of glycerin.

Campho-phenique (camphor and carbolic acid) is a valuable antiseptic dressing for wounds, the odor being more pleasant than that of carbolic acid, and, the solution being anodyne, it cannot be diluted with water or glycerin, but mixes with oil or ointments. It is a beneficial application in herpes and erysipelas, in vaginitis, vulvitis and paræsthesia of the vulva. Campho-phenique overcomes the fetor of lochial discharges. On account of its anæsthetic properties it is useful in the treatment of inverted toe-nail. It has been successfully given by the mouth in doses of 5 to 10 drops for the relief of gastric and intestinal catarrh. Campho-phenique is a serviceable local remedy in pharyngitis or tonsillitis. Paræsthesia may often be relieved by the topical use of this agent, either in its pure state or weakened by some suitable excipient.

Salol and camphor and beta-naphthol and camphor also form fluids having a valuable antiseptic power. By mixing equal parts by weight of camphor and absolute alcohol, and dissolving pyroxylin in the solution in the proportion of 1 in 40, an excellent substitute for collodion is obtained. Camphoid is the name given to the fluid and it is a good solvent for salicylic acid, carbolic acid and iodoform. Camphoid forms, in drying, an elastic film which is not dissolved by water and is a good coating for abrasions, superficial wounds, etc. A mixture of equal parts of camphor and menthol diluted with a mineral oil is useful, according to Dr. Seth S. Bishop, in a 10-per-cent. solution in acute nasal catarrh and laryngitis. In hypertrophic rhinitis a 25-per-cent. solution can be used. A 3- to 5-per-cent. solution is sufficiently strong for injection into the tympanum.

A solution of camphor in ether (30 in 180) has been applied to erysipelatous inflammation with benefit. Camphor has been used for the purpose of aborting boils. The seat of inflammation is touched three times a day with an alcoholic solution, and, after this has evaporated, the surface is covered with camphorated oil. Powdered camphor, likewise, is an efficient application to indolent ulcers and has been used with success upon specific ulcers of the genitals. A saturated solution of camphor in cologne-water gives relief in the headache which may occur at the menopause. Camphor and morphine, incorporated in a flaxseed poultice, allay toothache. A liniment or ointment containing camphor is useful in chilblains. The camphor ointment of our National Formulary may be used as an application to indolent ulcers. Camphor, either alone or combined as follows, yields serviceable antipruritics in eczema and paræsthesia :—

| | |
|---|---|
| ℞ Camphoræ, | |
| Beta-naphthol., | āā gr. x. |
| M. et adde— | |
| Ol. anthemidis, | ♏v. |
| Bismuth. subnit., | ʒj. |
| Pulveris marantæ, | ʒj. |
| Ungt. zinci oxidi, | ℥j.—M. |

| | |
|---|---|
| ℞ Camphoræ, | gr. x. |
| Sulphuris sublimati, | ʒss. |
| Ol. eucalypti, | ♏x. |
| Creosoti, | ♏viij. |
| Ungt. aquæ rosæ, | |
| Ungt. zinci oxidi, | āā ℥ss.—M. |

Camphor with salicylic acid (14 to 11) combines with the aid of heat, and, in the form of ointment, has been used in lupus and chronic ulcers. The odor of camphor is inhaled with some relief in coryza. Camphor cerate is a useful application for chapped hands and roughness of the skin, or the camphor can be incorporated in suet or lanolin :—

| | |
|---|---|
| ℞ Camphoræ, | ʒss. |
| Ol. neroli, | ♏iij. |
| Acidi carbolici, | ♏iv. |
| Sevi, | ℥ij. |

M. Sig.: Rub a small piece in the palm of the hand until soft, and apply over the surface for chronic eczema, chapped hands, fissures on the lips, at the angle of the mouth, or around the nipples, anus, or genital organs.

| | |
|---|---|
| ℞ Camphoræ, | gr. xx. |
| Ol. juniperi, | ♏xx. |
| Lanolin., | ℥j. |

M. Sig.: Use in the diseases above named.

Internally, camphor is valuable as an anodyne, antispasmodic, and carminative, in disorders of the digestive organs attended with pain or cramps, and is generally combined with astringents and opiates. Velpeau's diarrhœa mixture consists of equal parts of spirits of camphor, tincture of opium, and compound tincture of catechu.

In diarrhœa, Hope's camphor mixture is useful, especially in diarrhœa of relaxation in elderly subjects. Parrish's camphor mixture (mistura camphoræ aromatica, N. F.) is also valued :—

| | |
|---|---|
| ℞ Tr. lavandulæ co., | f℥iv. |
| Sacchari, | ℥ss. |
| Aquæ camphoræ, | f℥xvj. |

M. Sig.: A tablespoonful every three hours for diarrhœa.

This remedy is likewise very serviceable in infantile diarrhœa. It has been found efficient in Asiatic cholera, provided it be given at the inception of the disease.

Camphor, in 2-grain pills, is serviceable in dysmenorrhœa, hysteria, and obscure nervous manifestations in women. It may likewise be given to relieve palpitation of the heart. Monobromated camphor is esteemed a valuable remedy in chordee and irritable bladder; it has also been used in spasmodic affections, hysteria, epilepsy chorea, delirum tremens, whooping-cough, etc.

| | |
|---|---|
| ℞ Camphoræ, | gr. xx. |
| Ætheris, | q. s. ad ft. pulv. |
| Ammonii carbonat., | gr. xvj. |
| Pulv. opii, | gr. iv. |

M. et div. in chartulas no. xij.
Sig.: Give one every two or three hours, in coryza.

In order to allay the mental excitement of hysteria, M. Blocq orders :—

| | |
|---|---|
| ℞ Camphor. monobrom., | gr. xlv. |
| Ext. quassiæ, | ʒ ss. |
| Syrup., | q. s. |

M. et ft. pil. no. xxx. Sig.: One, two or three pills a day.

It has likewise been successfully employed in spermatorrhœa. Dr. Bourneville has obtained excellent results from the administration of monobromated camphor in the treatment of epilepsy, accompanied by frequent attacks of vertigo. As a result of his studies, Dr. Bourneville concludes that in vertiginous epilepsy the administration of monobromated camphor alone is remedial, but in the typical paroxysmal variety it should be given together with a combination of bromides. It is a curious fact that the addition of a few drops of camphor to a glass of water will, when injected into the rectum, produce a prompt evacuation of the bowels, thus offering a means of overcoming a tendency to constipation.

Camphor has at times been successfully employed in the management of mania, melancholia, and delirum tremens. A combination of camphor and opium relieves the after-pains of labor. The same drugs are advantageously given in the form of a suppository after operations upon the urethra, and in prostatorrhœa (enlarged prostate), cystitis, and, in fact, in all diseases of the genito-urinary organs, according to these formulæ :—

| | |
|---|---|
| ℞ Camphoræ, | |
| Iodoform. vel. aristol. vel iodol., | āā ʒj. |
| Ol. theobromatis, | q. s. |

M. et ft. suppos. no. xv.
Sig.: Insert one, when necessary, into the bowel.

| | |
|---|---|
| ℞ Camphoræ, | |
| Lupulini, | āā ʒj. |
| Ext. belladonnæ folior. alc., | gr. iiss. |
| Ol. theobromatis, | q s. |

M. et ft. no. x.
Sig.: Insert one in the bowel every two or three hours.

As camphor escapes from the system largely by the bronchial mucous membrane, it is a useful remedy in chronic bronchitis, especially when occurring in the weak or aged, or associated with emphysema. Its stimulant virtues render it useful, also, in capillary bronchitis and typhoid pneumonia. This substance may, in fact, be very serviceably administered in typhus or typhoid fever, or in the eruptive fevers, in order to strengthen the action of the heart.

In influenza Dr. F. W. Devereux Long prescribes:

| | | |
|---|---|---|
| ℞ Spir. camphoræ, | | fʒij. |
| Tr. lavand. co., | | fʒij. |
| Sp. chloroformi, | | fʒj. |
| Mucilag. tragacanth., | | f℥ij. |
| Aquæ, | q. s. ad | f℥vj. |

M. Sig.: Two tablespoonfuls every fourth hour.

Camphorated oil is an excellent application to swollen and painful breasts during lactation. Injections subcutaneously of camphorated oil are said by Alexander to be of benefit in tuberculosis, acting as a tonic, strengthening the heart and reducing fever. In laryngeal tuberculosis he applies it directly to the lesion. He injects 15 grains daily for four consecutive days, and, after an interval of eight or ten days, repeats the treatment in the same manner. Dr. L. Gaussia has made use of this combination in threatened heart failure, in influenza, pneumonia, typhoid fever and other debilitating diseases. This writer gave 30 to 60 drops daily of a 1-per-cent. to 5-per-cent. solution. Dr. Courtin reports good results in the treatment of tuberculous adenitis from injections of a mixture of 1 part each of beta-naphthol and camphor and 4 parts of 60° alcohol.

**Borneol** is an artificial camphor obtained from oil of turpentine by treating it with hydrochloric acid. It is said to be identical in chemical composition, and to closely resemble, in its physical characters, the natural camphor. According to Stockman, it has the same effects upon the circulation, but shows a tendency to depress or paralyze the pneumogastric nerves, and leads to palpitation of the heart.

**Camphoric Acid** is the product of the oxidation of camphor with nitric acid. It occurs in the form of fine white crystalline lamellæ, melts at 368.6° F., is slightly soluble in water, readily soluble in ethylic alcohol and ether. It is without odor, but has a somewhat acid and slightly astringent taste. In a healthy person it produces congestion of the face, neck and conjunctivæ with pain in the head. It checks the secretion of sweat even in the normal man, but seems to have no influence upon the saliva or to cause dryness of the throat and skin. Camphoric acid is eliminated in the urine and preserves that fluid from undergoing putrefactive changes for several days. It may be given in doses of 8 to 60 grains. The 1-per-cent. solution in water may be used in laryngological practice as a spray in catarrhal affections; it probably exerts some antiseptic as well as a sedative effect. The local application of a 2-per-cent. solution of camphoric acid is useful in acute coryza. Wende recommends the following as a good application in intertrigo and acute eczema:—

| | | |
|---|---|---|
| ℞ Acidi camphorici, | | ʒj. |
| Bismuth. subnitrat., | | |
| Zinci carbonat., | | |
| Pulv. amyli, | | |
| Vaselin., | | |
| Lanolin anhydr., | āā | ʒij. |

M. Sig.: For external use.

A 1-per-cent. solution is a serviceable gargle in many forms of sore throat. In combination with other remedies, such as boric acid or sodium borate, it is valuable in treating strangury and irritability of the bladder, and in the night-sweats of phthisis. The ammoniacal urine of cystitis is speedily cleared and rendered acid by the administration of 15 grains three times a day. It is of avail, also, as a local remedy in chronic cystitis, the bladder being washed out twice daily with a ½-per-cent. solution. A stronger solution than 1 per cent. is too irritant for use. In the night-sweats of phthisis, camphoric acid is perhaps superior to any other remedy. From an elaborate course of clinical experiments on fifteen phthisical men, aged from 18 to 52 years, Afanasieff has ascertained that, when it has been taken for several successive days and then discontinued, the sweats re-appear, but gradually, and only attain their initial intensity in from three to five days after the last dose. The remedy never gives rise to or increases diarrhœa or hæmoptysis. It causes no unpleasant effects beyond slight headache and some mental excitement, which is succeeded by sound sleep. The suppression of night-sweats is produced by daily doses of 30 grains or more; certainly by single doses of 30 grains, according to the experiments of Combemale. Dr. Howard has also seen camphoric acid repress profuse perspiration in acute rheumatism. Wood recommends it in spermatorrhœa and in enuresis; it has also been thought to have some influence over epilepsy, chorea, hysteria, and other spasmodic affections. When aniline and camphoric acid are heated, they combine, forming rose-colored crystals, which are soluble in ether or glycerin, and may be used (dose, gr. i–iv) in spasmodic affections. Sodium camphorate has also been used with similar, but less decided, effects.

### CANNABIS AMERICANA.—American Hemp.

### CANNABIS INDICA (U. S. P.).—Indian Cannabis, Indian Hemp.

*Preparations.*

*Extractum Cannabis Indicæ* (U.S. P.).—Extract of Indian Cannabis. *Dose*, gr. ss.

*Extractum Cannabis Indicæ Fluidum* (U. S. P.)—Fluid Extract of Indian Cannabis. *Dose*, ♏i–xx.

*Tincture Cannabis Indicæ* (U. S. P.).—Tincture of Indian Cannabis. *Dose*, ♏x–xx.

*Cannabinæ Cannas.*—Tannate of Cannabin. *Dose*, gr. i–x.

**Pharmacology.**—The Cannabis sativa (Urticaceæ), grown in the Southern United States and collected while flowering, constitutes Cannabis Americana, of which there are no official preparations. It should not be confounded with Asclepias incarnata, which is sometimes called white Indian hemp, or with Canadian hemp or apocynum. The flowering tops of the female plant of Cannabis sativa, grown in the East Indies, constitutes Indian hemp. A confection made from it is "haschisch" or "gunjah"; an inferior kind is known as "bhang." The American and East Indian plants are botanically the same, but the latter contains a larger quantity of the active principles, which are a resin, **Cannabin,** and a volatile oil. From the latter may be obtained **Canna-**

bene, of which the hydride is a crystalline substance. Churrus is the native name for the impure or crude resin.

**Physiological Action.**—Indian hemp has no local action. Upon the digestion or circulation no marked effect is produced. It acts like opium in first stimulating the nervous system and afterward depressing the vital functions. The primary stage of intoxication is accompanied by exhilaration, which lasts for some time before sleep occurs. During this period the imagination is actively engaged, intent upon visions of its own creation, which at first are pleasant, but which after awhile become disagreeable, like the hallucinations of delirium tremens. It is noticed, as one of the earliest manifestations of the toxic effect, that ideas of distance and relation are remarkably perverted; on account of the rapidity of the mental operations, the ideas of space and time are exaggerated so as to be almost intolerable, and there is often a curious sense of double consciousness. Numbness and tingling in the extremities are observed, followed by anæsthesia and diminution of muscular sense. Cannabis is antispasmodic, analgesic, hypnotic, and aphrodisiac. If a large dose be taken, coma or catalepsy may supervene, but a fatal effect rarely follows. The subsequent results from indulgence in this drug as an intoxicant are dullness and lassitude, vertigo and headache, diuresis, but not constipation. Frequent use of the drug brings about mental deterioration and unfitness for labor. The abuse of Cannabis Indica is a prolific cause of insanity in Eastern countries. An irresistible impulse to kill is, according to Dr. Thomas Ireland, one of the characteristic symptoms of intoxication from this drug. A case has been reported by Dr. J. Nevins Hyde in which, after a dose of one grain of Cannabis Indica, a papular and vesicular eruption made its appearance upon nearly every part of the body, and gave rise to severe itching.

**Therapy.**—Owing very largely to the uncertain quality of the drug, hemp has not been used to the extent that its physiological action would warrant. This has now been corrected so that reliable preparations may be obtained from reputable drug-dealers, and we may look forward to a revival of its use; but it is not probable that in this country it will ever be used as an intoxicant as it is in India. In acute mania it has been used, in combination with potassium bromide, with excellent results.

Cannabis Indica has been found extremely useful in acute dementia due to mental anxiety, and also in melancholia. Cannabis Indica may be successfully prescribed in order to combat the wakefulness of delirium tremens, and good results have been ascribed to it in the management of tetanus. It has been employed with advantage in chorea, and may sometimes be of avail in epilepsy. Amelioration has been produced by this remedy in senile trembling and paralysis agitans. In neuralgia and migraine good results follow its cautious use. In other painful affections Cannabis Indica may be resorted to with advantage. Dr. Stephen Mackenzie has found cannabis of value in the severe headache of cerebral tumors, in chronic and persistent cephalalgia, and in the violent pains of locomotor ataxia. He has found it of service also in gastralgia and enteralgia. It may be administered to mitigate the suffering caused by the passage of a hepatic or renal calculus. In acute or chronic rheumatism, in gout, and in carcinoma, hemp may often be very serviceably substituted for opium, over which it has the advantage that it does not derange the secretions.

Cannabis Indica quiets the delirium of cerebral softening. Dr. R. T. Edes, of Boston, has, in a number of instances, observed the use of this drug to banish the tendency to bad dreams. It allays the itching of eczema. In the itching which accompanies many cutaneous affections, and particularly in senile pruritus, the internal administration of cannabis Indica will often afford relief. In various uterine disorders it is used to relieve pain and bring about contraction of uterine muscular fibre. The pain of dysmenorrhœa may not infrequently be controlled by Cannabis Indica. Its influence upon the muscular structure of the womb renders it valuable in menorrhagia. Its virtue is enhanced in this affection by combination with ergot. It has been found particularly useful in the abundant floodings which sometimes precede the menopause, and, in fact, possesses considerable power as a general hæmostatic.

Cannabis Indica has also been used with advantage in uterine subinvolution and chronic endometritis. The headaches which attend the grand climacteric will sometimes yield to this remedy. In combination with nux vomica it is regarded by de Schweinitz as of value in headache dependent upon retinal asthenopia. It may be productive of good results in impotence unconnected with gross lesion. In spasm of the bladder and dysuria it gives relief, and also in acute gonorrhœa with chordee we see good effects from its exhibition. It can be given in either of these combinations with marked benefit for relieving the latter distressing symptom:—

| | |
|---|---|
| ℞ Extracti cannabis Indicæ fl., | fʒss. |
| Sodii bromidi, | ʒiij. |
| Mist. sodæ menth., | f℥iij. |
| Syrup. aurantii, | f℥ij. |

Sig.: A tablespoonful at bed-time. Repeat every hour or two until relieved.

| | |
|---|---|
| ℞ Extracti cannabis Indicæ, | gr. iij. |
| Chloral. hydratis, | ʒj. |
| Extracti opii, | gr. vj. |
| Ol. theobromatis, | q. s. |

M. et ft. suppositoriæ no, xij.

Sig.: Insert one in the bowel on retiring, and every two or three hours when troubled with chordee.

By some practitioners it is esteemed of value in acute and chronic Bright's disease, the presence of hæmaturia especially indicating its employment. Trial has been made of the drug in diabetes mellitus. Though it may, at times, be able to moderate cerebral irritability, it exerts no marked influence upon the course or severity of the disease. The spasm of asthma is sometimes very rapidly relieved by hemp. In whooping-cough, also, it may prove of service. It is a good remedy in irritable or reflex cough.

Mackenzie recommends the use of Cannabis Indica in hay fever and hay asthma. Germain Sée warmly recommends Cannabis Indica as a gastric sedative of particular value in functional disorders of the stomach and bowels attended with pain, acidity, and flatulence. He advises ¾ grain of the extract to be given in three doses, or it can be prescribed in the form of the fluid extract and creosote added with great advantage:

| | |
|---|---|
| ℞ Extracti cannabis Indicæ, fl., | ♏l. |
| Creosoti, | ♏v. |
| Syrup. acaciæ, | f℥iij. |

M. Sig.: A teaspoonful before meals.

It is also of value in the treatment of gastric ulcer and may be combined with silver nitrate, the efficacy of which it increases. Cannabis Indica is said by Macconnell to be of value in diarrhœa dependent upon indigestion. Cannabis Indica is said to do good in exophthalmic goitre, and to cure, in some instances, the opium or chloral habit. The tannate of cannabin is a good hypnotic, and has been used for insomnia among the insane. The same property is shared by cannabin and cannabinone, both of which are given in doses of ½ to 2 grains. The oil of hemp-seed (oleum cannabis) is a drying, fixed oil expressed from the seeds; it is green in color, disagreeable to smell, and bland to the taste. It is used in the manufacture of a green soft-soap of deservedly high reputation in treating eczema and other skin diseases.

The tincture of Cannabis Americana is regarded by some as equal in value to copaiba or sandalwood in the treatment of gonorrhœa. The preparation should be made from the fresh plant and be given in doses of 3 to 5 drops three or four times a day after subsidence of the acute symptoms.

## **CANTHARIS** (U. S. P.).—**Cantharides.** (Spanish Flies.)

### *Preparations.*

*Tinctura Cantharidis* (U. S. P.).—Tincture of Cantharides (5 per cent.). *Dose,* ♏i–x.

*Linimentum Cantharidis.*—Liniment of Cantharides (15 per cent. in oil of turpentine).

*Collodium Cantharidatum* (U. S. P.).—Cantharidal Collodion (60 per cent.).

*Ceratum Cantharidis* (U. S. P.).—Cantharides Cerate (cantharides, 32 parts; yellow wax and resin, āā 18 parts; lard, 22 parts).

*Ceratum Extracti Cantharidis.*—Cerate of the Extract of Cantharides (representing 30 per cent.).

*Charta Cantharidis.*—Blistering Paper (cantharides and Canada turpentine, each 1 part; olive-oil, 4 parts; spermaceti, 3 parts; wax, 8 parts; water, 10 parts; spread on paper).

*Emplastrum Picis Cantharidatum* (U. S. P.).—Plaster of Pitch and Cantharides Warming Plaster (Burgundy pitch, 92 parts; cerate of cantharides, 8 parts).

**Pharmacology.**—Cantharis vesicatoria (class, Insecta; order, Coleoptera) occurs in pharmacy in a dried state, either whole or in a more or less fragmentary condition, or as a brownish powder, in which the bright-green fragments of the elytra are very noticeable. The dust is very irritating, and the eyes should be protected when the drug is powdered in the mortar. The perfect flies are stronger than the powder, which often has been damaged by the ravages of mites, or lower forms of life. The active principle is **Cantharidin,** a fatty, crystallizable principle (discovered by Robiquet in 1810), contained chiefly in the soft parts, and especially the generative apparatus, the blood, and in the eggs (Leidy). It is soluble in alcohol, ether, chloroform, etc. Besides this, which is the active agent, there is a green oil, black matter soluble in water, a yellow viscid matter, fat, calcium and magnesium phosphates, acetic acid, and a volatile principle upon which the fetid odor depends, and which, according to Dragendorff, acts upon the system like cantharidin. The green coloring matter appears to be identical with chlorophyll.

**Physiological Action.**—When applied to the skin, an active preparation of cantharides causes burning pain with hyperæmia, to which, in the course of a few hours, succeeds the formation of vesicles, exhibiting a tendency to run together and form a large bleb corresponding with the area of application. If the action is continued, sloughing and ulceration result. The engorgement of the capillaries in the superficial structures is associated with anæmia of the deeper structures. When applied to the chest, the lung underneath becomes pale and anæmic, and, if its action be too long continued, a blister may cause inflammation of the pleura; or it may produce peritonitis if applied to the abdomen. Slight elevation of temperature attends the action of the blister, which may be followed by depression of temperature and weakening of the heart's action. Constitutional effects may be caused by absorption of the active principles through the integument. When introduced into the stomach, cantharides is capable of setting up much irritation and even gastro-enteritis, with vomiting, or purging and tenesmus. The active principles soon pass into the blood, and at first slightly stimulate the heart's action; but the effect is most marked upon the genito-urinary organs, as the kidneys are the chief organs by which they are excreted. Extreme irritation of the bladder is produced, the urine is voided frequently, and, owing to the congested state of the kidneys, often contains albumin and blood. There may be suppression of urine. Associated with this is priapism, with pain in the glans penis, urethra, bladder, and aching in the renal region. Sloughing of the external genitals has been known to occur in consequence of the administration of cantharides. Toxic doses, according to Cautieri, cause a rapid diminution of blood-pressure, decrease the force of the heart's action, but increase the pulse-rate. In fatal cases, inflammatory changes are found in the alimentary canal with intense hyperæmia of the bladder and kidneys.

The vulgar notion that cantharides causes erotic sensations, or increased sexual power, has no foundation except in the evidences of congestion and inflammation of the urinary passages just referred to. The results of swallowing a few grains of Spanish flies may be quite serious, and it is regarded by the law as a penal offense to administer this drug surreptitiously and with evil intent. The treatment of poisoning by cantharides is by bland drinks and opiates and a hot bath. Bismuth and cocaine are also of service. Animal charcoal has also been recommended as an antidote. An anæsthetic may be necessary.

**Therapy.**—Blisters are usually spread with cerate of cantharides, or preferably with the cerate of the extract of cantharides, the prescription being as follows:—

℞ Cerati extracti cantharidis, q. s.
Fiat emplastrum 2 × 3 in.
Sig.: Apply to designated spot and allow it to remain four hours. Then remove it and substitute a poultice.

The skin overlying the effusion should not be removed, but simply punctured to allow the serum to escape; the spot is then dressed with some bland fat, such as suet or benzoinated lard. A good way to raise a blister is to use the blistering collodion and paint one or two coats over the desired area, and lay over it a piece of waxed paper, under which the blister raises in a few hours. Saint-Philippe has suggested that the danger of strangury may be lessened by the preliminary use of an alkaline diuretic until the urine has become alkaline. It is likewise a good plan to sprinkle a few grains of morphine and camphor over the surface of the blister before it is placed in position. Blisters are employed therapeutically to relieve pain, to reduce inflammation, and as revulsants to promote absorption of inflammatory products. The warming plaster is very useful in pleurodynia. Meningeal or pleural inflammation may be checked by the prompt application of a good-sized blister to the scalp or to the chest. In iritis, blisters behind the ears are often serviceable. Dr. C. Ziem recommends painting cantharidal collodion behind the ear, extending downward as far as the jaw, in the treatment of affections of the eye, dependent upon nasal suppuration. He makes use of the same method for relief of absesses of the thyroid gland, inflammation of the frontal sinus and antrum of Highmore. In pericarditis, marked relief may be afforded by blistering. A blister over the stomach will arrest obstinate vomiting; and gleet is sometimes cured by a blister to the perineum. Vesication of the back of the neck is said by Swan to be a useful measure in cases of incontinence of urine. Neuralgia is promptly relieved by a small blister to the painful point; and neuritis is cured by flying blisters,—that is to say, a succession of small blisters along the course of the nerve. In acute rheumatism, marked relief is sometimes afforded to a swollen joint by surrounding it with small blisters. A blister over the affected joint is a good remedy in chronic synovitis. A large blister over the heart, applied early in the course of acute rheumatism, is often remarkably successful in reducing temperature and relieving pain; probably, also, it is of use in obviating the tendency to endocarditis, or curing it if present. In pleural effusion, absorption may be hastened in a similar manner, and also the clearing up of the lung after pneumonia. The warming plaster here may be worn for several days, if the skin is not too sensitive. Blisters must be used with caution in aged or debilitated patients; also in children. They should not be applied to parts deprived of vitality by paralysis, or to cicatricial tissue, or where the skin is poorly nourished. The possibility of absorption and serious results should be kept in mind. Nor should a blister be allowed to remain on too long. Cantharis should not be used as a vesicating agent in the case of patients whose kidneys are damaged. The cerate, or tincture, of cantharides enters sometimes into the composition of pomades or lotions for the treatment of alopecia circumscripta, and cantharidal collodion painted over the patches, every week or ten days, is at times efficacious.

In small doses, not exceeding two or three minims daily of the tincture, cantharides has been commended as a stimulant to the urinary organs, in hæmaturia, Bright's disease of the kidneys, pyelitis, cystitis, incontinence of urine, gleet, and leucorrhœa; but is contra-indicated in active conditions of inflammation. Given in this manner, it will usually relieve chordee. Ringer recommends full doses of the tincture of cantharides, in combination with tincture of iron and phosphoric acid or nux vomica, in the impotence due to old age, sexual excess, or masturbation. Cantharis has been employed with success in amenorrhœa due to atonic conditions and has suppressed passive seminal emissions of the same character. Cutaneous affections, especially psoriasis and other squamous diseases, are sometimes much benefited by similar small doses of the tincture. It has been used to produce abortion, and, in these small doses just mentioned, has emmenagogue properties. There is some evidence to show that the internal administration of tincture of cantharides may check the progress of cancer. Several cases have been reported in which the tumor remained stationary and the symptoms improved, or in which, many years after removal of the growth, there had been no recurrence. It was given in association with the wine of camphor.

**Potassium cantharidate** has been introduced by Professor Liebreich as a remedy in tuberculosis, especially of the larynx. It is given by hypodermic injection, in doses of 1 to 2 decimilligrammes. The injection excites a moderate degree of pain, but is not generally followed by pronounced febrile reaction. In cases of simple inflammation and tuberculous infiltration of the larynx, potassium cantharidate causes an exudation of serum, which is, however, quickly reabsorbed. Hoarseness diminishes and swallowing becomes less difficult. Tuberculous ulcers show a tendency to heal. In pulmonary tuberculosis it has been found without effect upon the fever, cough, expectoration, or physical signs. The treatment is apt to excite slight albuminuria and urobilinuria. Peterutti has reported three cases treated by him more than three years previously according to this method with, at the time, apparently unfavorable results. He found two of the cases completely cured and the third so much improved as to simulate a cure.

Benefit has sometimes resulted in cases of lupus and granular lids. The same method is said to have occasioned improvement in non-tubercular chronic laryngitis. Dr. Ch. Talamon states, that although he has witnessed no favorable effects of potassium cantharidate in tubercular cases he has observed that the salt possesses a decided diuretic action, more especially in tuberculous patients. In order to avoid the pain to which these injections give rise Dr. Hennig has employed cocaine cantharidate in tuberculosis and some other chronic affections, as ozæna, nasal and laryngeal syphilis, etc. He uses a solution of 3 to 6 parts of the remedy in 2,000 parts of chloroform water. and the quantity injected is equal to $\frac{1}{600}$ to $\frac{1}{120}$ grain of cantharidin. Cocaine cantharidate is rather a simple mixture than a chemical combination and occurs in the form of an amorphous, white powder, destitute of odor and having a saline and pungent taste. It dissolves with difficulty in cold water, but is readily soluble in hot water. It is insoluble in ether, alcohol and benzine. Cantharis has been made use of as a systemic stimulant in adynamic conditions, as after diphtheria or typhoid fever.

## CAPSICUM (U. S. P.).—Capsicum.*

**Dose**, gr. i–xx.

*Preparations.*

*Extractum Capsici Fluidum* (U. S. P.).—Fluid Extract of Capsicum (alcoholic). *Dose*, ♏i–v.

*Oleoresina Capsici* (U. S. P.).—Oleoresin of Capsicum. *Dose*, ♏$\frac{1}{20}$–ij.

*Tinctura Capsici* (U. S. P.).—Tincture of Capsicum. *Dose*, ♏v–fʒij.

*Emplastrum Capsici* (U. S. P.).—Capsicum Plaster (contains oleoresin).

*Infusum Capsici.*—Infusion of Capsicum (℥ss–Oj). *Dose*, fʒii–℥ss.

**Pharmacology.**—The fruit of Capsicum fastigiatum (Solanaceæ), dried and powdered, constitutes capsicum, or red pepper, which grows in the East Indies and on the coast of Guinea. Different varieties are cultivated all over the world for culinary and medicinal purposes. The Capsicum annum is most common in this country, of which there are a number of varieties, having different-shaped pods or large berries, the latter being picked green and used for pickling with vinegar. The chief constituent of red pepper is a crystallizable, acrid substance, **Capsaicin** (Thresh); also a yellow oil, resin, and a volatile alkaloid which in its odor resembles coniine.

**Physiological Action and Therapy.**—Capsicum occasions irritation when applied to the skin, and may produce vesication; it acts as a counter-irritant in relieving pain in the structures beneath, especially in neuralgia, subacute gout, chronic gout, rheumatism, and bronchitis. In the mouth the taste is hot and pungent, causing free flow of saliva, and similarly increasing the flow of gastric juice, producing warmth in the stomach, expelling flatus, and giving increased appetite and digestive power. Overdoses of capsicum will give rise to subacute or chronic gastritis. Excessive amounts cause severe pain, vomiting and purging.

Capsicum stimulates the action of the heart and increases the digestive functions. It promotes the excretion of urine and possesses an aphrodisiac influence. A prescription of much utility in debility of the sexual organs is:—

℞ Pulveris capsici,
  Extracti cocæ, . . . . . . . . . . . āā ʒj.
M. et ft. pilulæ no. xxx.
Sig.: Two pills three or four times a day.

The capsicum plaster may be used when mild counter-irritation is desired.

The tincture of capsicum may be employed with advantage in chilblains when the surface is unbroken. Dr. Rheims recommends that a strong tincture of capsicum-pods should be mixed with an equal quantity of mucilage of gum arabic. The mixture is brushed two or three times upon tissue paper, which is then applied to the affected surface and quickly relieves the itching and pain. Discolored bruises and chronic rheumatic pains are likewise benefited by the same treatment. Sawyer suggests a tincture of capsicum made with official, pure ether in place of rectified spirit. He reports† that ether, by its action on the sebaceous secretion of the skin, is preferable to alcohol as a menstruum for drugs designed to produce a therapeutic effect on or through the skin. It has also the advantage that oil of turpentine or a bland oil is easily miscible with it, if requisite to add either. He states that a mixture of equal parts of ethereal tincture of capsicum, liquor ammoniæ, oleum terebinthinæ, and oleum lini forms an excellent rubefacient liniment. An infusion of capsicum pods applied upon a piece of lint is remarkably efficacious in acute torticollis.

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* See paper by author on Capsicum, in the *Medical Bulletin*, November, 1886.

† *LondonLancet*, May 17, 1890.

The tincture of capsicum is an excellent application to the mucous membrane of the mouth and especially the gums. It enters into very many tooth-washes, the following, used by Garretson, being very serviceable:—

| | |
|---|---|
| ℞ Tinct. capsici, | fʒij. |
| Spiritus odorat., | f℥ij. |
| Alcoholis, | f℥ij. |
| Tinct. quillaiæ, | f℥iss. |
| Tinct. gentianæ comp., | fʒj. |
| Acidi acetici diluti, | f℥ss. |
| Acidi carbolici, | ♏ij.—M. |

Capsicum infusion is used as an application to scarlatinal sore throat, or diluted as a gargle in tonsillitis, pharyngitis, or may be used as a gargle, thus:—

| | |
|---|---|
| ℞ Tinct. capsici, | fʒj. |
| Potassii chloratis, | ʒiij. |
| Glycerini, | f℥ij. |
| Acidi hydrochlor. dil., | fʒiij |
| Aquæ rosæ. | ad fʒxij. |

Capsicum may be used externally as a hair-lotion for promoting the capillary growth:—

| | |
|---|---|
| ℞ Tinct. capsici, | f℥ss. |
| Tinct. saponariæ quil., | fʒj. |
| Glycerini, | fʒij. |
| Tinct. cantharidis, | fʒiij. |
| Spiritus rosmarini, | f℥iss. |
| Aquæ rosæ, | ad f℥viij. |

M. Sig.: Drop on the hair night and morning and brush the scalp well.

Capsicum is given internally after a debauch or in cases of drink-craving, as a substitute for alcoholic drinks. In chronic catarrh of the stomach of drunkards, the tincture of capsicum, in 10-drop doses before meals, serves as an appetizer. The tincture of capsicum is a valuable stimulant in delirium tremens. It may very serviceably be administered in beef-tea, and supports the heart, allays restlessness, and promotes sleep. Capsicum, in fact, possesses a slight narcotic power, and can be given thus with marked effect:—

| | |
|---|---|
| ℞ Tincturæ capsici, | fʒij. |
| Sodii bromidi, | ʒiij. |
| Elix. lupulini, | f℥iv. |

M. Sig.: Two teaspoonfuls in water every hour or two.

It is an excellent remedy in flatulent dyspepsia:—

| | |
|---|---|
| ℞ Pulveris capsici, | gr. xl. |
| Extracti nucis vomicæ, | gr. iij. |
| Extracti pancreatis, | ʒj. |

M. et ft. capsulæ no. xx.
Sig.: A capsule after meals.

It is beneficial in typhoid fever and typhoid conditions, as a stimulant. Capsicum acts as a useful adjuvant in the treatment of malaria. As this substance invigorates the muscular coat of the arteries, it may be advantageously employed in order to control hæmorrhage from the lungs or the womb. On account of its irritant effects, it is contraindicated in acute inflammation of the stomach or bowels. As excretion takes place by the kidneys, capsicum should be prohibited in inflammatory conditions of the genito-urinary tract; but in chronic disorders it may often be employed with advantage. In chronic nephritis, pyelitis, cystitis, and prostatorrhœa it frequently proves decidedly beneficial.

**CARBO ANIMALIS** (U. S. P.).—**Animal Charcoal.**

**CARBO LIGNI** (U. S. P.).—**Wood Charcoal.**
**Dose**, gr. x–xxx.

*Preparation.*

*Carbo Animalis Purificatus* (U. S. P.).—Purified Animal Charcoal. *Dose*, gr. x–ʒj.

**Pharmacology**.—Animal charcoal is prepared from bone by exposure to heat; and wood charcoal is obtained by a similar process from soft wood. The former occurs as a black powder or mass, the latter in large fragments preserving the shape of the billets of wood, or as a fine light powder. Purified animal charcoal is the charred bone after treatment with hydrochloric acid, which removes the earthy salts and leaves only the carbon. Recently-burned charcoal not only readily absorbs gases, and is thus an excellent deodorizer, but it destroys organic impurities by oxidation, decolorizing solutions containing them and rendering them inoffensive to taste or smell. Internally, it is given in too small doses to exert much effect of this kind in the intestinal tract, but it aids in purifying the stomach, partly by mechanical action. It increases secretion and peristalsis.

**Therapy**.—Charcoal is a good dressing to old or offensive gangrenous ulcers, as it absorbs the foul material and cleans the wound. It is generally utilized in the form of the charcoal poultice, being beaten up with bread-crumb or flaxseed-meal, or a small bag filled with powdered charcoal may be laid upon the poultice when it has been placed in position. It is sometimes used for tooth-powder, but it is open to the objection of scratching the teeth and discoloring the gums. Charcoal filters are useful in pharmacy, but not in the household, because, if not renewed daily, they lose their virtues, and only act as a breeding-place for germs of putrefaction and disease. Charcoal in powder, or animal charcoal may be administered in cases of poisoning by organic poisons. In flatulent dyspepsia recently-burned charcoal is sometimes beneficial. It has been used to relieve the pain of gastric ulcer and gastralgia.

**CARBONEI DISULPHIDUM** (U. S. P.).—**Carbon Disulphide.**

**Pharmacology and Therapy**.—Carbon disulphide is a clear, very diffusive liquid, of extremely offensive odor, and inflammable. It is an extremely refractive fluid, has a sharp, distinctive taste and a neutral reaction. It is highly poisonous, and its odor is also an objection to its internal use. It gives rise to severe headache and marked nervous excitement. Frequent exposure to its fumes occasions anæmia, physical and mental debility with, in some instances, amblyopia and epileptiform convulsions. Poisoning by this agent is treated by means of bromide and chloral, with the addition of stimulants if the circulation is depressed, although it is a valuable antiseptic, and has been used in typhoid fever, dyspepsia, and in gastric cancer. It has some anæsthetic and anodyne properties when inhaled. Locally, the vapor has been proposed to be applied for glandular enlargements and in defective secretion of cerumen in the ear. Local anæsthesia may be produced by the spray in neuralgia, etc.

**CARDAMOMUM** (U. S. P.)—**Cardamom.**

**Dose,** gr. v–xv.

*Preparations.*

*Extractum Cardamomi Compositum Fluidum.*—Compound Fluid Extract of Cardamom (cardamom, cinnamon, āā 400 parts; caraway, 200 parts; cochineal 100 parts; reduce to powder and percolate with alcohol, obtaining 880 parts; add glycerin, 120 parts). *Dose,* ♏xv.

*Tinctura Cardamomi* (U. S. P.).—Tincture of Cardamom (10 per cent.). *Dose,* fʒi-ij.

*Tinctura Cardamomi Composita* (U. S. P.).—Compound Tincture of Cardamom (cardamom 2, cinnamon 2, caraway 1, cochineal ½, glycerin 5, in dilute alcohol, q. s. ad 100 parts). *Dose,* fʒi–iv.

Cardamom also enters into the composition of aromatic powder (cardamom and nutmeg, āā 15 parts; cinnamon and ginger, āā 35 parts), and the aromatic fluid extract (pulv. aromatic., 100 grains; alcohol, q. s. ad 100 minims) and elixir adjuvans (N. F.).

**Pharmacology.**—The fruit of Elettaria repens (Scitamineæ) comes from Malabar, although other sources are recognized in commerce. The seeds are inclosed in capsules, the latter being valueless except as a protection for the former, which contain a volatile oil holding a camphoraceous substance in solution.

**Therapy.**—The seeds of cardamom are sometimes chewed and swallowed to relieve flatulence, or the tincture or compound tincture may be used, the latter being a valuable carminative combination. The compound fluid extract, though not official, is considered a better preparation than the compound tincture in the treatment of atonic dyspepsia and flatulence.

**CARDUUS BENEDICTUS.**—**Blessed Thistle.**

**Dose,** ʒi–v.

**Pharmacology.**—This plant belongs to the Compositæ and is a native of Asia and Europe. The leaves, sometimes the flowering tops, are used in decoction (℥ii–Oj), and a fluid extract and solid extract have also been used. A bitter neutral principle, **Cnicin,** crystallizing in colorless prisms, soluble in alcohol, less so in water, appears to be the principal constituent; potassium nitrate is also present.

**Therapy.**—Carduus is a bitter tonic used in Germany in digestive weakness and chronic hepatic complaints; best given as the fluid extract

(♏xv-fʒj at a dose), in which the menstruum is diluted alcohol. Cnicin has been given in doses of 5 to 10 grains in intermittent, fever but in these quantities it is apt to cause nausea, vomiting and diarrhœa. The **Carduus Marianus**, or St. Mary's Thistle, another variety, is used for the same purposes, but it is especially in repute for treating cases of gall-stones. It has also been extolled as a hæmostatic, laxative, and diuretic. (Lobach).

**CARMINUM.—Carmine.**

The red coloring matter obtained from cochineal; entirely soluble in water. (See Coccus.)

**CAROTA.—Carrot Fruit.**

**Dose,** gr. xxx–ʒj.

**Pharmacology and Therapy.**—The seeds of Daucus carota (Umbelliferæ), of a grayish color, about $\frac{1}{8}$ inch in length, contain a volatile oil of aromatic odor and taste. Used in powder as a carminative and diuretic.

**CARUM** (U. S. P.).—**Caraway.**

**Dose,** gr. x--xxx.

*Preparation.*

*Oleum Cari* (U. S. P.).—Oil of Caraway. *Dose,* ♏i–v.
Enters into compound spirit of juniper and compound tincture of cardamom.

**Pharmacology and Therapy.**—The fruit of Carum carvi (Umbelliferæ) contain a volatile oil, and are prized as a condiment. They are used as a stimulant in flatulence, or in combination to prevent griping of other medicines. A case has been reported in which 1 drachm of the oil of caraway produced cerebral congestion, delirium, and rigors in a man. Caraway has been thought to possess galactagogue properties.

**CARYOPHYLLUS** (U. S. P.).—**Cloves.**

*Preparations.*

*Oleum Caryophylli* (U. S. P.).—Oil of Cloves. *Dose,* ♏i–vj.
*Infusum Caryophylli.*—Infusion of Cloves (2 per cent.). *Dose,* f℥i–ij.
Also enters into compound tincture of lavender, aromatic tincture of rhubarb, aromatic syrup of rhubarb, and wine of opium.

**Pharmacology.**—Cloves are the dried, unexpanded flowers of Eugenia aromatica (Myrtaceæ), a large tree of the Spice Islands and Africa. They are dark-drown in color, about half an inch long, and have a strong, spicy odor and pungent, aromatic taste, owing to the presence of a heavy volatile oil (15 to 20 per cent.). They also contain **Eugenin,** a tasteless crystalline substance, salicylic acid, and a neutral, tasteless, odorless body, **Caryophyllin,** which crystallizes in needless. Eugenol, called also eugenic acid, obtained by oxidation from the oil of cloves, is an aromatic liquid, readily soluble in alcohol and but slightly soluble in water. Clove-stalks are the flower-stalks of the cloves; mother-cloves are the whole fruit. Both of these are used to adulterate ground cloves.

**Physiological Action.**—Cloves are stimulant, carminative, and antiseptic. The oil has some anæsthetic influence over painful areas. In overdoses it will cause gastro-enteritis, has a soporific effect and occasions death from respiratory failure. The oil of cloves is eliminated by the kidneys, liver, bronchial mucous membrane, and skin. It possesses antiseptic virtues.

**Therapy.**—The oil of cloves is used to destroy the nerve in hollow, aching teeth, and quickly relieves pain. In combination with lanolin, it may be used for eczema. The infusion is used internally as a stomachic tonic for the relief of flatulence and pain, but it is generally given in combination with other remedies. It is said that a half or one drop of the oil of cloves, given in a little water, will rapidly allay excessive vomiting.

The growth of tubercle bacilli is retarded by tincture of cloves, and Mannotti, in eighteen cases of local tuberculosis, obtained marked improvement from injections of a 10-per-cent. emulsion of cloves in olive-oil. In lupus vulgaris the repeated application of oil of cloves is said to cause separation of the epithelium and retrocession of the nodules.

The oil of cloves is a parasiticide and has been made use of as an application in pediculosis. Eugenol, a constituent of the oil of cloves, has been combined, by a patented process, to form a compound termed benzoyl-eugenol, or benz-eugenol. This product, it is thought, may prove useful in the treatment of tuberculosis. Eugenol has been used as an antiseptic remedy in the daily dose of 45 minims.

The acetamide of eugenol, a crystalline substance, is an active antiseptic and is also an excellent local anæsthetic. This compound may be advantageously employed in dentistry and minor surgery. It is prepared by acting upon the sodium salt of eugenol with monochloracetic acid, adding alcohol and chlorine gas and treating with a strong solution of ammonia. Another combination which has been introduced is cinnamyl-eugenol, a colorless, crystalline substance, destitute of odor and taste, soluble in hot alcohol, ether and chloroform. This compound has been applied to the treatment of tuberculosis.

### CASCA CORTEX.—Sassy Bark.

**Pharmacology.**—The Erythrophlœum guineense (Leguminosæ) is a large tree growing on the coast of Africa, which furnishes the ordeal bark of Angola; otherwise casca, or sassy bark. It contains an alkaloid, **Erythrophlœine.** A tincture (10 per cent.) has been used by Brunton, in doses of 5 to 10 minims.

**Physiological Action.**—The powder causes sneezing when inhaled. The infusion or tincture gives rise to vomiting and purging and intoxication, followed by death during convulsions. Upon the circulation erythrophlœum has an action like digitalis.

**Therapy.**—In its native country sassy bark is employed in the treatment of intermittent fever, flatulent dyspepsia, diarrhœa, and dysentery. Brunton finds the tincture useful in dilated heart without valvular disease; also in mitral disease and dropsy.

According to Professor Germain Sée, sassy bark is very useful in dyspnœa, markedly increasing the depth of inspiration. It disturbs the digestion more than digitalis. The hydrochlorate of erythrophlœine is a salt in the form of a powder, soluble in water, which can be administered hypodermically in doses of gr. $\frac{1}{60}$–$\frac{1}{12}$ as a local analgesic, but it is inferior to cocaine for this purpose.

**CASCARA AMARGA.—Honduras Bark.**

**Pharmacology and Therapy.**—The Cascara amarga (Simarubaceæ), or Honduras bark, has some reputation as a tonic and alterative The fluid extract (dose fʒss–j, several times a day) may be used in syphilis, chronic liver disease, nasal catarrh, and skin diseases (eczema, psoriasis, syphilodermata, etc.).

**CASCARA SAGRADA.**—See Rhamnus Purshiana.

**CASCARILLA** (U. S. P.).—**Cascarilla-Bark.**

**Dose,** gr. ii–xx.

**Pharmacology.**—The bark of Croton eluteria (Euphorbiaceæ) from the Bahama Islands. It has a warm, rather bitter taste, and emits a fragrant odor when burned. **Cascarillin** is a bitter neutral substance, with volatile oil, resin, and tannin as the principal constituents. There are no official preparations, but the fluid extract, infusion, and tincture are used, none of which are miscible with water.

**Therapy.**—Cascarilla is a light tonic, somewhat stimulant and carminative, and the infusion has been used in low fevers. It may be profitably employed as a tonic in convalescence from typhoid fever or other exhausting disease.

**CASSIA FISTULA** (U. S. P.).—**Purging Cassia.**

**Dose,** ʒj.

**Pharmacology and Therapy.**—The fruit of Cassia fistula (Leguminosæ), a tree of the West Indies, is in cylindrical pods of a dark-brown color, containing from twenty-five to one hundred seeds in separate cells, and a dark-brown, soft, sweetish pulp, having an odor like prunes and containing about 60 per cent. of sugar. Good cassia yields about 30 per cent. of the pulp, which is the medicinal part of the drug. This is laxative in its action in doses of a drachm or more. There are no official preparations of cassia, but the confection of senna contains 16 per cent. of cassia fistula. Cassia fistula promotes the secretion of bile and communicates a brownish or greenish tint to the urine.

**CASTANEA** (U. S. P.).—**Chestnut.**

*Preparations.*

*Extractum Castaneæ Fluidum* (U. S. P.).—Fluid Extract of Chestnut. *Dose,* fʒi–ij.

*Infusum Castaneæ.*—Infusion of Chestnut-Leaves. *Dose,* fʒii–℥ss.

**Pharmacology and Therapy.**—The leaves of Castanea dentata (Cupuliferæ), collected in September or October, while still green. They contain tannin, gallic acid, salts, and gum. A recent infusion has been employed with success in whooping-cough, and might be used for diarrhœa, but for the latter purpose the fluid extract would be better.

## CASTOREUM.—Castor.

**Dose,** gr. x–xx.

### *Preparation.*

*Tinctura Castorei.*—Tincture of Castor. *Dose,* f ʒ -jij.

**Pharmacology.**—Castor is the dried secretion of the preputial membrane of the castor fibre or beaver. It is of unctuous consistency, a brown or reddish-brown color, a pungent, disagreeable smell and a bitter, nauseous taste. It is soluble in alcohol and ether. Castor contains a volatile oil, a peculiar principle, of crystalline structure, termed castorin, and salicylic aldehyde, together with other organic and inorganic constituents.

**Therapy.**—This substance has a certain stimulant effect upon the nervous system and acts as an antispasmodic. It has been given to control the spasms of hysteria and other convulsions, the tremors of typhoid fever, and those dependent upon an adynamic condition. It may be given with advantage in tympanites. Castor is supposed to possess emmenagogue properties and has been administered in amenorrhæa and uterine colic.

## CATECHU (U. S. P.).—Catechu.

**Dose,** gr. i–xxx.

### *Preparations.*

*Tinctura Catechu Composita* (U. S. P.).—Compound Tincture of Catechu (catechu and cinnamon, in diluted alcohol. *Dose,* ♏x–fʒj.

*Trochisci Catechu* (U. S. P.).—Troches of Catechu (1 grain each). *Dose,* 1 or more.

**Pharmacology.**—Catechu is obtained from the Acacia catechu (Leguminosæ), a large tree of Pegu. It is in large masses, hard and brittle, glossy and porous on fracture; taste strongly astringent and sweetish; very little odor. The constituents of black catechu, or cutch, are **Catechu-Tannic Acid** and **Catechin,** the latter being insoluble in water; but the extract is entirely soluble in alcohol, though insoluble in ether. With iron, greenish-brown precipitates are formed.

**Therapy.**—Catechu is a valuable astringent. It may be used as a mouth-wash for spongy gums, a gargle in pharyngitis, or as an injection in gonorrhœa or leucorrhœa; but is most frequently employed in diarrhœas of relaxation.

## CATHA.—African Tea.

A small shrub of Northwestern Africa, used by the natives as a stimulant and temporary substitute for food. Forskall gave it the name of Catha edulis (Celastraceæ). The leaves are chewed like those of the Erythroxylon coca, and are invigorating and restorative, and the recent infusion acts like that of tea, maté, or coffee. The plant has been analyzed without detecting caffeine. Fluckiger has isolated an alkaloid, **Katine,** which is probably a liquid.

An alkaloid, which seems to be the active principle, has recently been obtained by Prof. Ugolino Mosso, of Genoa.* To this substance the discoverer has given the name of **Celastrine.** It is present in the plant in such small quantities that its exact chemical composition has not yet been determined. During a primary stage and in small doses, celastrine is stimulant to the nervous system of frogs; during a secondary stage and in large doses, it is depressant. It produces an excitant effect upon the heart of the same animal. In dogs and rabbits, blood-pressure and respiration were not notably influenced, but the activity of the sympathetic nerve was modified. In his experiments, Professor Mosso found celastrine fatal in amounts in which cocaine is merely excitant. In intoxication from celastrine sensibility is preserved to the last and convulsions are lacking. The stimulant effect of celastrine is essentially manifested upon the brain, without leaving a trace of depression or visible disturbance of function. The spinal cord, vagi nerves, and heart may share the stimulant effect, but are less powerfully affected.

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* See *Medical Bulletin*, August, 1891.

In medicine, catha might be useful as an arterial and nervous stimulant like coca, and probably would afford a cheap substitute at the table for the expensive tea so largely used, if once introduced in this country.

**CAULOPHYLLUM** (U. S. P.).—**Caulophyllum, Blue Cohosh.**

**Dose,** gr. xv–xl.

*Preparation.*

*Extractum Caulophylli Fluidum.*—Fluid Extract of Caulophyllum. *Dose,* ♏xv–xl.

**Pharmacology.**—The rhizome and rootlets of Caulophyllum thalictroides (Berberidaceæ), or squaw-root, a plant indigenous to this country. It contains a glucoside, **Saponin,** and two resins, the latter constituting the substance supplied as **Caulophyllin.**

**Therapy.**—Caulophyllum is emmenagogue and parturifacient and diuretic. It has some reputation in the treatment of rheumatism. It probably has some value as an expectorant, owing to the presence of saponin, which is analogous to senegin found in Polygala senega, and might be valuable in bronchitis and catarrhal pneumonia.

**CEDRON.**—**Cedron-Seed.**

**Dose,** gr. i–ij.

**Pharmacology.**—The Simaba cedron (Simarubaceæ) of the United States of Columbia contains two alkaloidal substances, **Cedrine** and **Cedronine.** The seeds have a bitter taste.

**Therapy.**—Cedron-seed has a reputation in South America for curing malarial affections, and is largely used in derangements of the digestive organs, diarrhœa, cholera morbus, etc. It is also claimed to have decided influence over the course of hydrophobia, and is said to be of value in treating poisoned wounds, bites of venomous snakes, insects, etc. The remedy is used both topically and internally, the usual dose being 1 or 2 grains; but Dr. Purple gave it in doses of 20 or 30 grains every four hours in intermittent fever with satisfactory results.

**CERA.—WAX.**

*Preparations.*

*Cera Alba* (U. S. P.).—White Wax (yellow wax bleached).
*Cera Flava* (U. S. P.).—Yellow Wax.
*Ceratum* (U. S. P.).—Cerate (white wax, 30, lard 70).

**Pharmacology and Therapy.**—Wax is a peculiar, concrete substance, prepared by Apis mellifica (Hymenoptera, class Insecta), forming the honey-comb; also found in certain plants. It is insoluble in water and cold alcohol, but soluble in boiling alcohol, ether, chloroform, and oils. It is a soft solid, liquefying a little above the body-temperature, and is unirritating, except mechanically, to the skin and mucous membranes. It is largely used to give consistency to ointments and suppositories.

**Epidermin.**—This name has been given to a new ointment base, prepared by S. Kohn by melting ½ ounce of white wax and triturating it in a warm mortar with an equal quantity of powdered gum arabic until a homogeneous paste is produced. To this mass is then added a boiling mixture of ½ ounce each of water and glycerin, and the whole is stirred together until cold. The result is a semi-fluid, creamy substance which, when applied to the surface in a thin layer, forms an adherent and flexible coating. Drugs which are to be incorporated with epidermin should be previously rubbed up with glycerin.

**CERII OXALAS** (U. S. P.).—**Cerium Oxalate.**

**Dose,** gr. i–x.

**Pharmacology.**—Cerium oxalate occurs as a white, granular powder, odorless and tasteless, insoluble in water or alcohol, but soluble in hydrochloric acid.

**Therapy.**—Sir J. Y. Simpson brought forward this remedy as one of great value in treating the vomiting of pregnancy, in which it is sometimes successful, but often fails. It is useful in controlling excessive cough in phthisis or chronic bronchitis, and in nervous disorders, chorea, epilepsy, and dysmenorrhœa. This salt occasionally proves useful in vomiting depending upon uterine disease, or even in cancer of the stomach. Cerium oxalate has been successfully employed to relieve obstinate vomiting occurring during the course of typhoid fever and phthisis. Dr. Busey prescribed it for the purpose of relieving nausea and headache produced by opium. It is a sedative to the gastric mucous membrane, and may allay the pain of gastralgia. It is beneficial in dyspepsia occasioned by depressed or deranged innervation of the stomach. The following prescriptions, containing cerium oxalate, have been employed with service:—

| | | |
|---|---|---|
| ℞ Cerii oxalatis, | | ʒ iss. |
| Bismuth. subnit., | | ʒ iiss. |
| Spiritus chloroformi, | | fʒ ij. |
| Liquor calcis, | | |
| Syrup. acaciæ, | āā | f℥ ij. |

M. Sig.: Two teaspoonfuls in water when necessary for nausea and diarrhœa.

| | |
|---|---|
| ℞ Cerii oxalatis, | gr. xl. |
| Ext. hyoscyami, | gr. iij. |
| Ext. conii, | gr. vj. |
| Ext. gent., | gr. ij. |

M. et ft. pil. no. xij.
Sig.: A pill every four hours for nausea and vomiting, especially of pregnancy.

Cerium oxalate is also occasionally efficacious in chronic diarrhœa.

It is liable to be contaminated with other metals, such as arsenic, lanthanum, etc., to which some of its therapeutic effects have been attributed.

If the remedy be pure, it may be given in doses of 10 grains every four hours. Failure from its use has been ascribed to the smallness of the dose which is generally prescribed. Cerium nitrate was also employed by Simpson, who regarded it as useful in irritable dyspepsia with gastrodynia and pyrosis, as well as in chronic vomiting. The dose is the same as that of the oxalate.

### **CETACEUM** (U. S. P.).—**Spermaceti.**

*Preparations.*

*Ceratum Cetucei* (U. S. P.).—Spermaceti Cerate (10 per cent.).
*Unguentum Aquæ Rosæ* (U. S. P.).—Rose-Water Ointment.

**Pharmacology.**—Spermaceti is a peculiar, concrete, fatty substance obtained from Physeter macrocephalus (class, Mammalia; order, Cetaceæ), or sperm-whale. It is a fatty substance, with little taste or odor; can be reduced to a powder by the addition of a little alcohol. Unlike other fats it does not yield glycerin when saponified, but **Ethal.** It is almost pure **Cetin,** or palmitate of cetyl. It is not acted upon by a boiling dilute solution of soda, and leaves no grease-spot on paper.

**Therapy.**—Used almost exclusively as an ingredient in ointments, although an emulsion with wax and yelk of egg is prepared as a demulcent in irritation of the bowels. The unguentum aquæ rosæ, or cold cream, is an elegant application for excoriated surfaces and chapped hands and lips.

### **CETRARIA** (U. S. P.).—**Iceland Moss.**

*Preparation.*

*Decoctum Cetraria* (U. S. P.).—Decoction of Iceland Moss (5 per cent.). *Dose,* f℥i-iv.

**Pharmacology.**—The sea-weed, Cetraria islandica (Lichenes), is found in northern latitudes. It contains **Lichenin,** or lichen-starch (70 per cent.), which forms a mucilage when hot water is added. Lichenin is a yellowish-white powder which swells up in cold water and dissolves after eight hours' digestion in hot water. There is also cetrarin or cetraric acid, a bitter principle (about 2 per cent.), which can be removed by washing with a weak alkali. Cetrarin occurs in the form of snow-white acicular crystals. It combines with alkalies to form salts. Cetraria also contains small quantities of lichstearic acid.

**Therapy.**—It has some value as a food, and its demulcent qualities have led to its use in pulmonary affections and bowel disorders in the form of decoction. In such disorders Iceland moss jelly is an agreeable demulcent. It is made by adding to a quart of boiling water, a handful of well washed moss, the juice of two lemons, one glass of wine and a quarter of a teaspoon of cinnamon. The moss is first soaked for an hour in a little cold water, then placed in the boiling water and allowed to simmer until dissolved. It is then sweetened, flavored and strained into moulds.

Kobert has ascertained that cetrarin increases intestinal peristalsis, augments the number of red and white blood-corpuscles, especially when they have been reduced by disease, and is a mild stimulant to the central nervous system. It may, therefore, prove of service in chlorosis attended by loss of appetite and constipation. The dose is given as 1½ to 2 grains. Cetrarin, when injected into a vein, causes an increased secretion of saliva, bile and pancreatic juice. In accordance with this action it has been beneficially employed in dyspepsia.

In Iceland cetraria is esteemed prophylactic against a prevalent form of elephantiasis. Dr. Eckfeldt states that cetraria possesses antihæmorrhagic power and has been recommended in hæmoptysis. The powder, blown into the nostrils, will arrest epistaxis. A tincture of cetraria is a good application to spongy gums. The therapeutical properties of the lichens have been studied by Dr. Eckfeldt.* Rocella tinctoria is astringent, diuretic, and a demulcent expectorant. Species of the genera Usnea and Alectoria are useful, locally and systemically, in hæmorrhoids. Among the Parmelias, several exert an antiperiodic influence. Reindeer-moss is a demulcent tonic, diuretic, astringent, and alterative.

**CHAULMOOGRA-OIL.—Chaulmoogra-Oil.**

**Dose,** ♏v–xx, in capsule.

**Pharmacology and Therapy.**—The expressed oil from the seeds of Gynocardia odorata (Bixineæ) contains gynocardic acid. The oil is soluble in ether, chloroform and alcohol.

Gynocardic acid is a yellowish, oily substance, of an acrid, burning taste and distinct odor. In leprosy, chaulmoogra-oil has been used with asserted good results, both locally and internally. Though unable to cure the disease, it has in some cases delayed the progress and mitigated the symptoms. It has been positively demonstrated that, under the influence of the internal administration of chaulmoogra-oil the bacilli present in the blood have diminished in number or have actually disappeared. The remedy is given in gradually increasing doses, but is apt to excite intolerance. It may also be serviceable, combined with other ointments, in treating chronic skin diseases. Chronic eczema, psoriasis, and lupus are benefited by the application of an ointment containing chaulmoogra-oil. Chaulmoogra-oil has been applied with success in cases of scabies and pediculosis. The ointment has likewise been used upon the enlarged glands of scrofula and in chronic rheumatic arthritis. From 20 to 30 grains of the oil to the ounce of excipient is the average strength of the ointment.

| | |
|---|---|
| ℞ Zinci carbonat., | |
| Pulv. marantæ, . . . . . . . . . . . | āā ʒj. |
| Olei chaulmoogræ (*vel* acidi gynocardici), . . . . | fʒss. |
| Ungt. hydrarg. ammoniat., . . . . . . . . | ʒij. |
| Lanolini, . . . . . . . . . . . . . | ℥ss. |

M. et ft. ungt.

For chronic eczema, psoriasis, scrofuloderma, lupus, and lepra.

In place of the oil gynocardic acid has been made into an ointment, 20 grains to the ounce, and made use of in the same cases. Gynocardic acid has been used both externally and internally in leprosy, syphilis and rheumatic affections. Its dose for internal use is from ½ to 3 grains. In the Hospital Saint-Louis, of Paris, gynocardic acid has recently been substituted for the oil in the treatment of epilepsy. The acid is given in the daily dose of 3 grammes, representing 17 grammes of the oil. It is given alone in capsules, in pills, each containing 4 grains of magnesium gynocardate and 1 grain of extract of gentian, or in capsules containing sodium gynocardate.

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* "Chemical and Medicinal Properties of Some Lichens," *Medical Bulletin*, March, 1892.

**CHEKAN.—Cheken.**

*Preparation.*

*Extractum Chekan Fluidum.*—Fluid Extract of Cheken. *Dose*, f℥i–iij.

**Pharmacology.**—The leaves of Myrtus chekan, or Eugenia chekan (Myrtaceæ), a shrub or small tree of South America. It contains tannin and an ethereal oil; also chekenon, chekenic acid, cheken bitter, chekenetin. Of these the ethereal oil alone offers medicinal interest (Weiss). This is antiseptic, diuretic, and expectorant.

**Therapy.**—Cheken was introduced from Chili through the enterprise of Messrs. Parke, Davis & Co., as a remedy in chronic catarrhal inflammation of the respiratory passages. Dr. Murrell, of London, extols it in the winter-cough of elderly people, and in other forms of chronic bronchitis. In Chili it also enjoys a reputation in the treatment of rheumatism.

**CHELIDONIUM** (U. S. P.).—**Chelidonium, Celandine.**

**Dose,** gr. x–xl.

**Pharmacology.**—Celandine is the whole herb of Chelidonium majus (Papaveraceæ), found both in Europe and North America. It contains two alkaloids, **Chelidonine** and **Sanguinarine,** in combination with **Chelidonic Acid.** A bitter, yellow, crystalline principle, **Chelidoxanthine** (Probst), is also present, besides tannic acid, starch, cellulose, etc.

**Physiological Action.**—It has a bitter, acid taste, and stimulates the secretions of the glands along the intestinal tract, including the liver. In considerable doses it causes vomiting and purging, diaphoresis, and increases the urinary secretion and also the secretions of the bronchial mucous membrane.

**Therapy.**—The fresh, milky juice may be used as a local irritant, and has been applied upon warts and corns. Internally, in doses of 10 grains of the extract, it acts as a drastic purgative, and has been used in jaundice due to catarrhal swelling of the bile-ducts.

**CHENOPODIUM** (U. S. P.).—**Chenopodium, American Wormseed.**

**Dose,** gr. x–xl.

*Preparation.*

*Oleum Chenopodii* (U. S. P.).—Oil of Chenopodium. *Dose*, ♏v–xx.

**Pharmacology.**—American wormseed is the fruit of Chenopodium ambrosiodes, variety Anthelminticum (Chenopodiaceæ), a plant of North America and Europe. It has a peculiar aromatic odor and a warm bitter taste. Its properties are due to the presence of a peculiar volatile oil, a thin, yellowish, offensively aromatic liquid, which is official.

**Physiological Action and Therapy.**—The volatile oil acts as a stimulant to the circulation and nervous system, making it serviceable in chorea and neurasthenia. The oil of chenopodium has been employed in hysteria. In Chili chenopodium is esteemed as an aid to digestion and as an emmenagogue. Dr. Murillo regards it as an excellent carminative in the treatment of infantile colic. Its common use is for the expulsion of lumbricoid worms, and it is best given in doses of 10 minims, in capsules or emulsion, three times a day, castor-oil being administered the following day; or the remedy may be administered night and morning for several days, and followed by a brisk cathartic.

Chenopodium album, white goose-foot, lamb's quarter, or hog-weed, a plant common in cultivated ground, and flowering in July and August, is possessed of hæmostatic properties. A tincture made from the leaves and flowers by absolute alcohol, is given in the dose of 1 or 2 drops frequently repeated in acute hæmorrhage, and in the same dose two or three times a day, for the purpose of preventing recurrence of bleeding.

### **CHIMAPHILA** (U. S. P.).—**Chimaphila, Pipsissewa.** (Prince's Pine.)

*Preparation.*

*Extractum Chimaphilæ Fluidum* (U. S. P.).—Fluid Extract of Chimaphila. *Dose* ♏xx–xl.

**Pharmacology.**—The leaves of Chimaphila umbellata (Ericaceæ) contain tannin and a colorless, bitter, crystalline, neutral principle, **Arbutin,** and a colorless and tasteless substance, in yellow crystals, **Chimaphilin.** The fresh leaves are also slightly irritating.

**Physiological Action and Therapy.**—Pipsissewa is diuretic and alterative. The urine is darkened by the use of this remedy. It has very little effect upon the heart or circulation. Upon the digestive organs it is tonic and astringent. As it is not an irritating diuretic, it can be used in Bright's disease and nephritis; also in hæmaturia. In lithæmia, gout, rheumatism, and kindred disorders, this is a valuable remedy. As it favors elimination, it has produced good results in scrofula, skin diseases, gleet, leucorrhœa, and intermittent fever. A decoction (℥ii–Oj) may be used, but a good fluid extract is better.

### **CHINA.—China-Root.**

**Pharmacology and Therapy.**—The rhizome of Smilax glabra and Smilax China (Smilaceæ) of China and Japan has the same constituents and properties as sarsaparilla, but is more active. It is best given in the form of fluid extract of China, in doses of f℥ss–j, several times a day.

### **CHINOIDINUM.—Chinoidin, Quinoidin.**

**Pharmacology.**—A mixture of alkaloids, mostly amorphous, obtained as a by-product in the manufacture of the crystallizable alkaloids of cinchona. (See Cinchona.)

Chinoidin possesses tonic and antiperiodic properties. It is a dark-colored substance, and is active in about double the dose of quinine, but is apt to disorder the stomach.

**CHINOLINA.—Chinolin, Quinolin.**
**Dose,** gr. viii–xvj.

*Preparations.*

*Chinolinæ Salicylas.—Dose,* gr. v–xxx. *Chinolinæ Tartras.—Dose,* gr. v–xxx.

**Pharmacology.**—Chinolina is a colorless, oily liquid, darkening on exposure to light, and is a constituent of coal-tar, but is prepared commercially by treating anilin or nitro-benzol with glycerin in the presence of a dehydrating agent. It may also be obtained by the distillation of quinine, cinchonine and strychnine with potassium. The odor recalls that of nitro-benzol. It is slightly soluble in water, and the solution possesses a pungent taste. Chinolin is readily soluble in alcohol, ether and chloroform. It is a hygroscopic substance.

In its chemical characters it is so closely related to quinine as to lead to its substitution in medicine. Dr. Julius Donath claims that its physiological and therapeutic effects are also identical with the natural alkaloid. The tartrate is the salt chiefly used, which is in shining silky, crystals, with penetrating odor and pungent taste, permanent in air, and soluble in water. It is less soluble in alcohol; insoluble in ether and chloroform. The free base is highly irritant to the gastric mucous membrane. A salicylate has also been prepared.

**Physiological Action and Therapy.**—Chinolin is a valuable antiseptic, but its offensive odor has prevented its application in this direction in medicine; however, it is believed that much of this objection can be removed by better modes of preparation. If it could be obtained without odor or taste, it would be a valuable agent for the preservation of food. The tartrate and salicylate are also powerful antizymotics. Internally, these salts are antipyretic and antiperiodic, in doses rather larger than those given of quinine (ʒss daily, for adults).

It may be given to children in peppermint-water, or syrup and distilled water, or to adults in capsules or wafers. Neuralgia dependent upon a malarial taint is often relieved by chinolin tartrate. In zymotic diseases, other than malarial, chinolin has not proved satisfactory as an antipyretic, because it has been found to be too depressing in its effects upon the heart. As a topical application in diphtheria, it may be diluted with alcohol (♏x–f℥j) and used with a spray, or painted on with a brush, to the affected part. A solution of the tartrate (gr. iii–v–f℥j) has been used as an injection for gonorrhœa.

Analgen is the name given to a derivative of quinolin. It is a white, crystalline powder, insoluble in water, soluble in hot alcohol and in acids. When mixed with nitrous acid a yellow precipitate is formed. It has been used with success in neuralgia and has alleviated rheumatic pains. In some cases it causes the urine to assume a dark red color. This tint is due to a change which analgen undergoes in the organism. The molecule may be entirely destroyed or the benzoyl group which enters into its composition may be separated with complete oxidation of the residue. In the latter event the urine is reddened by the action of the free amido produced in the uric acid.

**CHIRATA** (U. S. P.).—**Chirata.**

**Dose,** gr. xv–xxx.

*Preparations.*

*Extractum Chiratæ Fluidum* (U. S. P.)—Fluid Extract of Chirata. *Dose,* ♏x–xxx.

*Tinctura Chiratæ* (U. S. P.)—Tincture of Chirata (10 per cent.). *Dose,* fʒi–ij.

**Pharmacology.**—The whole herb, Swertia chirata (Gentianeæ) of India, is used as a bitter aromatic tonic in the East, but rarely prescribed in this country or England. It contains two amorphous principles, **Ophelic Acid** and **Chiratin** (Höhn), but **no tannin.**

**Therapy.**—Chirata resembles gentian very closely, to which it is allied botanically, but it is more bitter. It has similar therapeutic applications in atonic dyspepsia, etc. Chirata may often be very serviceably combined with bismuth subnitrate, or with hydrochloric acid, for the relief of the sick stomach of drunkards. It is useful in functional inactivity of the liver. By its action on the liver it indirectly overcomes constipation. As it contains no tannic acid, chirata can be prescribed in combination with iron, if desired

**CHLORAL** (U. S. P.).—**Chloral, Chloral Hydrate.**

**Dose,** gr. ii–xx.

**Pharmacology.**—Chloral (trichloracetyl hydride) is a colorless liquid formed by the prolonged action of chlorine upon alcohol;* with water it forms a crystallizable compound. Chloral hydrate is in the form of colorless, transparent crystals; of bitterish, caustic taste; of pleasant, ethereal but not acrid odor; freely soluble in water and in alcohol. Pure chloral should be of a neutral reaction. The crystals volatilize slowly at ordinary temperatures, and should be kept in a tightly-stoppered bottle; they melt at 135° F. and boil at 208° F., and are at the same time decomposed into anhydrous chloral and water. If concentrated sulphuric acid be added to chloral it is converted into a white, solid substance having the same composition as chloral, but is not soluble in water. Chloral also combines with alcohol to form crystals of alcoholate of chloral, which are less soluble than hydrate of chloral. When triturated with camphor or crystals of carbolic acid, hydrate chloral forms a permanent oily liquid. In contact with iron, even in small quantity, crystals of chloral hydrate acquire a peculiar yellow discoloration in consequence of the liberation of free hydrochloric acid.

**Physiological Action and Poisoning.**—Chloral hydrate is antiseptic and sedative, although slight irritation may occur at first. It is a hypnotic, causing sleep by producing an anæmic condition of the brain, the patient waking after several hours as from natural sleep. Unpleasant after-effects are occasionally observed. The reflex activity of the spinal centres is weakened, and this, extending to the medulla, causes paralysis of the respiratory centre. No effect is seen upon the sensory nerves, but the motor nerves are gradually affected, muscular weakness being one of the prominent phenomena attending chronic chloral poisoning. Chloral acts powerfully upon the heart, lowering and weakening its rate of movement through a local influence upon the ganglion and muscle. With this there is lowering of arterial pressure, aided by dilatation of the superficial vessels. When death is caused by chloral, the heart is arrested in diastole. The decided fall in the bodily temperature is probably secondary to the cooling of the blood by dilatation of the cutaneous blood-vessels. Dyspnœa may be produced by engorgement of the lungs, due to the weakened cardiac action and to the local enlargement of the pulmonary vessels. Death is produced by respiratory failure usually, although it occurs sometimes with such suddenness as to lead to the supposition that it is due to syncope from direct action upon the heart.

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* It derives its name from the first syllables of the substances from which it is made.

In a few cases, death appears to be due to some deleterious action upon the blood, resembling scurvy, as purpuric and scorbutic eruptions occur with swollen, ulcerated gums, great prostration, and collapse. We treat the first class of cases of gradual respiratory failure by stopping the remedy, with the administration of stimulants externally by friction, local warmth, and sinapisms, and internally by hot coffee, and artificial respiration, galvanism, etc., with physiological antidotes, such as atropine and strychnine. Dr. Colenso recently reported to the London Clinical Society a case of recovery from chloral poisoning in consequence of the use of atropine and strychnine hypodermically. In the second class of cases, unfortunately, death occurs too quickly for the action of remedies; but hypodermic injections of ether, atropine, or strychnine, with evacuation of the stomach by the pump and the introduction of hot alcoholic stimulants, might be serviceable in saving life. In the third class of cases, transfusion of blood might be required, or the administration of large doses of the tincture of ferric chloride. There is a remarkable variation as regards the quantity capable of producing a fatal effect. Cases are on record in which from half an ounce to an ounce produced alarming symptoms, though recovery took place. On the contrary, death has been caused by a single dose of 30 grains. Chronic chloralism, presenting symptoms of muscular weakness or paralysis, moral perversion, feeble heart, epileptiform convulsions, and delirium tremens, is relieved by prompt removal of the drug and the administration of tonics, especially nux vomica or strychnine. Animals poisoned with chloral hydrate recover if they are kept warm. In some cases an erythematous rash follows the administration of chloral, and desquamation of skin from the fingers around the extremities has been noticed. Other cutaneous manifestations which have been noticed in consequence of the administration of chloral are wheals, papules, vesicles, pustules, petechiæ and ulceration. Toxic doses have been followed by symptoms of purpura hæmorrhagica.

An eruption from chloral is especially apt to occur in children, weak and cachectic patients, and those who suffer from disease of the nervous system, as hysteria, chorea, myelitis, or general paralysis. The commonest cause of such a rash, however, is the ingestion of alcohol at the same time with chloral.

This substance is removed from the system principally by the kidneys; it also escapes by the breath, to which it gives a peculiar odor. In large amounts chloral is irritant to the kidneys, may excite nephritis and cause the passage of bloody urine.

It is probable that some of the serious effects following the administration of chloral are properly attributable to impurities in the drug. If the crystals have a pungent, acrid odor, they should not be used; recrystallized chloral hydrate should be preferred for medical use. Where the heart is seriously affected and its walls are thin and weak, chloral should, as a rule, not be given. It is also dangerous to use it freely in alcoholic subjects. According to the experiments of MM. Cadeac and Malet upon dogs, morphine administered by the stomach and soon followed by a rectal injection of chloral produces complete anæsthesia, which continues for more than half an hour.

**Therapy.**—The antiseptic action of chloral is utilized in surgery, where 5-per-cent. solutions are used as stimulating dressings for suppurating wounds and foul ulcers. This solution also may be applied to parasitic skin affections (tinea versicolor). It is also used to check itching in eczema and prurigo. In urticaria, Quinquaud uses a lotion containing 30 parts of boric acid, 5 parts of chloral hydrate and 180 parts of distilled water. Dr. Marc Sée is in the habit of using an ounce of a 10-per-cent. solution for injection into the sac of a hydrocele after the fluid has been evacuated. In two or three days a large effusion takes place, but is soon absorbed. The same solution may be advantageously injected into the neighborhood of varicose veins. The blood gradually coagulates and the vessels contract. Dr. J. Palvy, from his experience in fifteen cases, believes that the injection per rectum of a solution containing from 15 to 25 grains of chloral hydrate is an efficient remedy in hæmoptysis. In combination with other remedies, it is used as an anodyne and counterirritant in neuralgia and rheumatism:—

| | |
|---|---|
| ℞ Chloral., | ʒij. |
| Lin. saponis, | f℥iv.—M. |

For application to pleurodynia, lumbago, etc., the combination of chloral and camphor may be used:—

| | |
|---|---|
| ℞ Camphoræ, | |
| Chloralis, | āā ʒj. |
| Misce et adde | |
| Lanolini, | ℥j. |
| M. For neuralgia. | |

Mr. Lenox Browne praises the virtue of a mixture of equal parts of chloral-hydrate and camphor as an application in neuralgia. The mixture forms a clear fluid, which is applied over the affected part. He has found it of great service in neuralgia of the larynx, in relieving spasmodic cough and toothache. Chloral is useful in trismus nascentium, the cramps to which pregnant women are often subject, singultus, spasmodic and nocturnal enuresis. Dr. Lyon Playfair recommends chloral for the purpose of relieving the pain of parturition. It may be administered either by the mouth or rectum, and it is asserted that two or at most four doses of 15 grains each at intervals of twenty minutes minimize suffering without weakening the energy of the uterine contractions. This remedy has also been used in cases of rigidity of the os uteri.

In diphtheria a gargle of 2-per-cent., followed by application of a 20-per-cent. solution, is said to cause prompt disappearance of the false membranes.

Two or three grains of chloral to the ounce of water has been successfully used as an injection in gonorrhœa. Garretson employs the following combination, containing chloral, with effect as an injection in gonorrhœa:—

| | |
|---|---|
| ℞ Chloralis, | |
| Plumbi acetatis, | āā gr. viij. |
| Aquæ dest. | f℥ viij.—M. |

The principal symptom for which chloral is prescribed is insomnia from mental overwork, or occurring during the course of typhus or typhoid, in delirium tremens, in phthisis, or in the aged. In acute mania, especially that caused by alcohol, very large doses have been followed by the best effects. When injected (ʒi–ij) into a vein, general anæsthesia is produced, but this method has no special advantage, and presents some decided disadvantages. The restlessness and insomnia present in general paralysis of the insane are allayed by the administration of this remedy, and it is also beneficial in spasmodic affections, chorea, whooping-cough, asthma, uterine pains, and tetanus. A dose of chloral at bed-time is useful in paralysis agitans, and may be able to ward off an attack of nocturnal epilepsy. Chloral affords relief in laryngismus stridulus. The hypodermic injection of 5 to 10 grains of chloral hydrate, in combination with $\frac{1}{8}$ to $\frac{1}{4}$ grain of morphine sulphate, is highly recommended in cholera morbus attended with collapse and in the algid stage of Asiatic cholera. If the patient cannot be made to swallow, an emulsion may be prepared with egg containing 1 or 2 drachms of chloral, and given per enema. This drug also acts as an antidote in cases of poisoning from physostigma, picrotoxin and strychnine. If, on account of spasm, the patient cannot swallow the antidote may be serviceably administered by the rectum.

In cases of undue arterial excitement, during the early stage of pneumonia or overaction of a hypertrophied heart, or in the increased arterial tension of Bright's disease, chloral judiciously used may be of service. It is given with much benefit in allaying the discomfort of seasickness. In congestive headache with insomnia a combination like the following is advantageous:—

| | |
|---|---|
| ℞ Chloralis, | ʒj. |
| Morphinæ hydrobromat., | gr. j. |
| Aquæ camphoræ, | f℥ij. |

M. Sig.: A dessertspoonful every two hours until relieved.

It has been found useful in scarlet fever by Wilson, who gives gr. i–ij in a little syrup of lactucarium and water every two or three hours for a child five years of age. Sir Benjamin Ward Richardson esteems chloral as a valuable antipyretic in typhoid fever. In tetanus 10 to 20 grains should be given every hour or two, according to the gravity of the case, gradually lengthening the intervals and afterward reducing the dose. In convulsions after labor, an enema containing 1 drachm of chloral should be thrown into the rectum, or 30 or 40 grains given by the mouth. Dr. Deshages, of Orleans, advocates the hypodermic injection of chloral in puerperal eclampsia and also in convulsions from other causes. In the convulsions of children, it is a very prompt and efficient remedy. In restlessness and insomnia, chloral may be very advantageously prescribed with potassium bromide, as—

| | | |
|---|---|---|
| ℞ Chloralis, | | ʒiij. |
| Potassii bromidi, | | ʒv. |
| Syrup. lactucarii, | | |
| Syrupi aurantii flor., | āā | f℥ij. |

M. Sig.: A dessertspoonful at bed-time.

For the relief of night-sweats of phthisis, 1 drachmn may be dissolved in 3 ounces of dilute bathing-whisky and the patient's skin bathed with it. This is also a good application to prevent bed-sores.

The compounds of chloral with camphor, salicylic acid, and with carbolic acid, are useful as antiseptics, especially the latter, which is free from unpleasant odor and is anodyne as well as antiseptic.

The unpleasant taste of chloral hydrate may be overcome by mixing its solution with lemonade.

**Chloral Butylicum.**—Butyl chloral hydrate, or croton chloral (*Dose*, gr. ii–xxx), is obtained by the action of chlorine upon acetic aldehyde and collected by distillation. It is the hydrate of trichlorbutylaldehyde, and is in the form of white, shining, crystalline scales, having a pungent smell and a disagreeable, acrid taste. Butyl chloral hydrate is soluble in alcohol, ether, glycerine and hot water. The action is like that of chloral, but said to be less depressing to the circulation and heart. It is more anodyne, and is especially useful in neuralgia. Five grains are given every half hour in neuralgia of the face. Liebreich, who was the discoverer of this drug, praises it as a hypnotic in doses of gr. xv–xxx. Croton chloral gives relief in headache due to eye-strain, and Ringer has found it very beneficial in migraine. It has also proved serviceable in dysmenorrhœa.

The following combination is recommended in neuralgia:

| | |
|---|---|
| ℞ Croton chloral., | ʒij. |
| Spt. vini rectificat., | f℥ij. |
| Elix. guaranæ, | f℥iij. |

M. Sig.: A teaspoonful every half hour or hour.

A mixture of butyl chloral and tincture of camphor is recommended as a topical application in neuralgia.

The following formula has been published as of service in migraine:—

| | | |
|---|---|---|
| ℞ Chloral butylic., | | gr. xv. |
| Tr. gelsemii, | | ♏xxx. |
| Tr. Cannabis Ind., | | ♏xv. |
| Glycerin, | | f℥ss. |
| Aquæ, | q. s. ad. | f℥iij. |

M. Sig.: A third to be taken at once. The dose to be repeated in half an hour.

It may also be administered in the form of a solution containing 10 parts of butyl chloral and 20 parts of glycerin to 120 parts of distilled water, a teaspoonful representing 15 grains of the remedy.

From experiments upon frogs Grigorescu states that butyl chloral is an energetic physiological antidote to strychnine.

## CHLORALAMID.

**Dose,** gr. xxx–ʒi.

**Pharmacology.**—Chloralamid occurs in the form of white, granular crystals, which melt at 230° F., and are soluble in water and alcohol. Hot water must not be used in making solutions, as the substance is destroyed when the mercury ascends above 140° F. It is decomposed by caustic alkalies and alkaline carbonates. When heated to its melting point chloral is liberated. The dose of chloralamid ranges from 15 to 60 grains. It may be given in capsules or cachets, but a better method of administration is to dissolve it in a portion of wine, whisky, or brandy. Its best effects are obtained when exhibited an hour or an hour and a half before bed-time.

**Physiological Action.**—Chloralamid is free from local irritant properties. It has but a slight taste and exerts little or no deleterious influence upon digestion. It has been given for months continuously without causing any decrease of the bodily weight. The compound has no action upon the bowels or kidneys. According to the testimony of most observers it exerts little or no depressant influence upon the circulation. Langgaard and Mairet and Bose, however, state that it reduces blood-pressure and enjoin caution in its use when organic heart disease exists. Chloralamid is thought to have a stimulating effect upon the respiratory centre. The chief physiological action of chloralamid is that of a hypnotic. Sleep is often produced within half an hour after its administration. Sometimes drowsiness continues upon the following day. Large doses have occasionally produced headache, vertigo, sickness of the stomach, thirst, incoherence, and cardiac depression.

Dr. Pye-Smith has reported a case in which 80 grains of chloralamid, given in two portions of 40 grains each at eight hours interval, gave rise to severe universal dermatitis followed by profuse desquamation. There was fever which lasted a week, and the urine was slightly albuminous.

**Therapy.**—Chloralamid is principally employed in the treatment of insomnia, especially when due to nervousness, neurasthenia, hysteria or chronic alcoholism. It has been beneficially used as an adjuvant in epilepsy and is of value in relieving the paroxysms of cardiac asthma. So far as has yet been observed the existence of organic disease of the heart is no positive contra-indication to its employment. The effects of chloralamid, like those of every active drug, require to be carefully watched. Dr. W. Hale White has given it with advantage in several cases of valvular disease. As a rule, chloralamid will not overcome sleeplessness caused by pain, though in a number of instances it has succeeded in carcinoma, rheumatism, neuralgia, alcoholic neuritis, herpes zoster and dysmenorrhœa.

Chloralamid is efficacious in bronchial asthma, emphysema, pleurisy, and pulmonary tuberculosis by causing sleep and, consequently, preserving strength. It has, moreover, been successful in overcoming wakefulness attendant upon cirrhosis of the liver, ulcer of the stomach, nephritis and pelvic disorders. It has likewise, in the same manner, been of service in typhoid fever, erysipelas and diabetes. This remedy has a sphere of usefulness in nervous and mental disorders. It is most useful in melancholia and chronic mania. In acute mania and progressive paralysis it often proves of no avail. It is of service in idiocy with hallucinations, acute and chronic paranoia, periodic psychoses, and neuritis multiplex. Chloralamid is of service in senile dementia, but is useless in cases where excitement is a prominent feature.

In the cerebral disturbances of children it answers a very good purpose. Chloralamid has been given with good effect in acute simple meningitis. Dr. Alt, of Halle, has obtained satisfactory results from the use of chloralamid in chorea, and Dr. Hexamer, of Stamford, Conn., employed it successfully in alcoholic tremor. Dr. James Wood reports that chloralamid exerts a favorable influence on the night-sweats of phthisis. This statement is confirmed by the results of the comparative study of several remedies by Dr. Henry Conkling, who found that it suppressed night-sweats in about half the number of cases in which it was given. At the same time it allayed the cough. As a hypnotic and sedative it is beneficial in whooping-cough, influenza, laryngismus stridulus, and persistent tinnitus aurium. A solution containing 30 grains each of chloralamid and potassium bromide to the ounce is known under the name of chlorobrom and is highly recommended by Professor Charteris and others as serviceable in cases of sea-sickness. It has also been found of value in obstinate vomiting from other causes.

**Choral-caffeine.**—A molecular combination of choral with caffeine presents itself in the form of white, shining crystalline scales, easily soluble in cold water. Professor Ewald, of Berlin, has used chloral-caffeine subcutaneously in single doses of 3 to 4½ grains, or in daily doses of 6 to 13½ grains. The injections ordinarily occasion but little pain. Relief was afforded by this method of treatment in inflammatory rheumatism, sciatica, emphysema and nephritis. It was also found of service in chronic constipation.

**Chlormethyl** is highly praised by Débove* in cases of sciatica and other neuralgias.

### CHLORALOSE.—Anhydro-gluco-chloral.

**Dose,** gr. iii–vj.

**Pharmacology.**—Chloralose is produced by the action of anhydrous chloral on glucose. It crystallizes in fine needles, is very bitter to the taste, readily soluble in hot water, but dissolves with difficulty in cold water. In the process of manufacture a second substance results. This is known as parachloralose and crystallizes in the form of fine pearly lamellæ, which melt at 229° C. (412.2° F.). The melting point of chloralose is given as 184° to 186° C. (363.2° to 366.8° F.).

**Physiological Action.**—According to the experiments of Prof. Ch. Richet and Dr. Hanriot, chloralose has a marked hypnotic effect upon dogs when given in small doses. In large quantities it is toxic. Chloralose stimulates the spinal cord. Reflex action is not diminished, but may even be exaggerated. It is claimed that, even in large doses, chloralose causes no diminution of arterial pressure. Temperature is reduced from one-fifth to three quarters of a degree. Chloralose is said to produce an increased excretion of urea and chlorides.

**Therapy.**—From 3 to 6 grains occasioned a dreamless and refreshing sleep, which was not followed by nausea or headache. It was administered advantageously in some cases where chloral and morphine had been badly borne. Sleep is generally produced in half an hour after administration of the drug, is tranquil and unaccompanied by perspiration. Féré has given chloralose in doses from 12 to 24 grains without ill effects. The effect is maintained from four to ten hours. Large doses have been known to cause flushing of the face, tremors, epileptiform convulsions, headache, uncertainty of speech and urticaria. A number of cases, however, have occurred in which doses of 3 to 6 grains occasioned convulsions or cataleptic symptoms, while cyanosis with collapse has also been observed as the result of moderate amounts. Hysterical individuals are particularly susceptible to its influence. According to Flemming, chloralose is of benefit in functional insomnia and in that due to psychical excitement, hysteria, neurasthenia, overwork, and functional cardiac irritability. He found it of service also in attacks of epilepsy and somnambulism, but states that it fails in wakefulness dependent upon alcoholic excitement, multiple neuritis, and any painful organic lesion or peripheral irritation.

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* *Buffalo Medical and Surgical Journal*, April, 1889.

In cases of insanity, without excitement, it produces sleep; when excitement is present it will usually act as a sedative and, at least in some instances, is capable of banishing hallucinations. Dr. J. Sagaze has observed a suppression of night-sweats produced by the administration of chloralose in phthisis. In hectic fever he has used with advantage a combination of quinine and chloralose. This writer has also found chloralose of service in other chronic pulmonary affections, such as chronic bronchitis with bronchiectasis and fœtid secretion, accompanied by copious prespiration. From his experience in the Children's Hospital, Dr. F. Gordon Morrill, of Boston, regards chloralose as more reliable than chloralamid. Dr. E. Chambard has noticed chloralamid increase the inco-ordination of locomotor ataxia and the tremor of paralysis agitans.

Parachloralose had been thought to possess hypnotic properties, but, according to the experiments of M. Richet, it is an almost inactive body with neither toxic nor therapeutic effect.

## **CHLOROFORMUM** (U. S. P.).—**Commercial Chloroform.**

### *Preparations.*

*Chloroformum* (U. S. P.).—Chloroform. *Dose*, for inhalation, ♏xx–f℥j; internally, ♏x–xx.

*Mistura Chloroformi.*—Mixture of Chloroform (chloroform, purified, 8; camphor, 2; egg-yelk, 10; and water, 80 parts). *Dose*, f℥i–iv.

*Spiritus Chloroformi* (U. S. P.).—Spirit of Chloroform. *Dose*, f℥ss–j.

*Linimentum Chloroformi* (U. S. P.).—Chloroform Liniment (chloroform, 30; soap-liniment, 70 parts).

*Linimentum Aconiti et Chloroformi* (N. F.).—Liniment of Aconite and Chloroform (tincture of aconite and chloroform, of each, 2 parts; soap-liniment, 19 parts).

*Aqua Chloroformi* (U. S. P.).—Chloroform-Water. *Dose*, f℥i–iv.

**Pharmacology.**—Commercial chloroform is impure, only containing 98 per cent. of chloroform, and is used solely for pharmaceutical purposes, as a solvent, or for external application. Purified chloroform is "a heavy, clear, colorless, diffusive liquid, of a characteristic, pleasant, ethereal odor, a burning, sweet taste, and a neutral reaction." It is obtained by adding chloral hydrate to an alkaline solution, or by the action of chlorinated lime upon ethyl oxide, or alcohol, and distillation. It is afterward purified by the addition of sulphuric acid, sodium carbonate, and lime, and re-distillation. Chloroform is only sparingly soluble in water, but mixes with alcohol and ether in all proportions. It is itself a remarkable solvent, dissolving most alkaloids, resins, gutta-percha, caoutchouc, paraffin, iodine, bromine, fixed and volatile oils, etc. Chloroform is not inflammable, but when mixed with alcohol it may be burned, and chlorine gas will be evolved. Charles Martin has adduced reasons to show that chloroform vapor, in the presence of a naked flame, is decomposed with the ultimate formation of hydrochloric acid. The accumulation of the acid in the atmosphere may be sufficient to produce marked bronchial irritation. Chloroform-vapor is much denser than atmospheric air and diffuses slowly. Chloroform is unfit for anæsthetic purposes unless it be absolutely pure and fulfills the tests of the pharmacopœia. "If 5 cubic centimetres of purified chloroform be thoroughly agitated with 10 cubic centimetres of distilled water, the latter, when separated, should not affect blue litmus-paper (absence of acids), nor test solution of silver nitrate (chloride), nor test solution of potassium iodide (free chlorine). If a portion be digested, warm, with solution of potassa, the latter should not become dark colored (absence of aldehyde). On shaking 10 cubic centimetres of the chloroform with 5 cubic centimetres of sulphuric acid in a glass-stoppered bottle, and allowing them to remain in contact for twenty-four hours, no color should be imparted to either liquid. If a few cubic centimetres be permitted to evaporate from blotting-paper, no foreign odor should be perceptible after the odor of the chloroform ceases to be recognized." The purified chloroform contains about $\frac{3}{4}$ to 1 per cent. of alcohol. It must be kept in glass-stoppered bottles in a cool and dark place.

At the suggestion of Professor Liebreich, M. Pictet, of Geneva, has applied his process for the liquefaction of gases to the production of absolute chloroform. At 70° C. (94° F.) a crystalline body separates from liquid chloroform. The fluid, from which the crystals have been removed, recrystallizes somewhat below 100° C. (148° F.) and the second crystallization represents absolute chloroform. At 15° C. (59° F.) the purified compound has a specific gravity of 1.51 and is said to be perfectly stable without the addition of alcohol. It cannot yet be demonstrated as certain, however, that the Pictet process is superior to the methods of purification heretofore employed. The decomposition of chloroform under the influence of light and air is regarded by some chemists as a natural characteristic of the fluid, and not due to the presence of impurities. It has, in fact, been demonstrated that, without the addition of 1 per cent of alcohol, Pictet's chloroform undergoes decomposition and that no sensible difference exists between this and any other well-purified product.

Chloroform was discovered in 1831, by Mr. Samuel Guthrie, of Sackett's Harbor, N. Y., and about the same time by Soubeiran in France, and Liebig in Germany. It was first used as an anæsthetic by Sir James Y. Simpson, of Edinburgh, in 1847.

**Physiological Action.**—When kept in contact with the skin for some time, it causes irritation and, finally, vesication. After absorption, it exerts a sedative effect. Internally, it produces a feeling of warmth in the stomach and acts as a carminative, antispasmodic, and sedative; large doses are irritant. When introduced into the circulation, whether by absorption from the broncho-pulmonary mucous membrane during inhalation or by that of the stomach, the effects are the same. After a brief period of stimulation, the depressing effect of the drug is manifested, and in overdoses it is a cardiac poison, acting by destroying the contractility of the heart-muscle. Prof. John A. MacWilliam, of Aberdeen, has demonstrated that, even when gently administered in moderate quantities and with a due admixture of air, chloroform causes an appreciable dilatation of the heart. This dilatation may precede the loss of the conjunctival reflex, and affects both sides of the heart. It frequently occurs before any fall of blood-pressure. Artificial respiration, therefore, often fails to revive the patient because the enfeebled and distended heart is unable to maintain the circulation. The dilatation is not produced through the pneumogastrics, but is the direct effect of the drug upon the cardiac mechanism.* In a later series of experiments this writer has shown that the primary stage of cardiac acceleration is due to a more or less complete paralysis of the vagi produced by the chloroform. The subsequent retardation occurs "through a depressing or retarding influence exerted on the intrinsic rhythmic mechanism of the organ." During anæsthesia the pupils are contracted. The occurrence of anæsthesia is announced by complete muscular relaxation and abolition of the conjunctival and cremasteric reflexes. Dilatation of the pupils while the subject is fully under the influence of chloroform is an ominous sign. The anæsthetic should be immediately withdrawn and measures taken to invigorate the respiration and circulation and restore the patient to consciousness. Chloroform is eliminated by the lungs and the kidneys. It proves irritant to the kidneys as it escapes from the system.

The administration of chloroform, especially if prolonged, is usually followed by the appearance of albumin and casts in the urine, a fact which suggests that the renal secretion should be examined before the patient is placed under the influence of the anæsthetic. It generally kills in Europe and America by heart-paralysis, though, according to the recent report of the Hyderabad Commission to the *British Medical Journal*, in India it kills dogs by failure of respiration. It has no special effect upon the blood, unless the decided lowering of bodily temperature is to be attributed to its action upon the red blood-corpuscles, interfering with their function as oxygen-carriers to the tissues. The absorption of chloroform by different tissues of the body has been studied by Pohl. In the blood of dogs profoundly influenced by the anæsthetic the blood contained much less than it is capable of dissolving, but the red corpuscles held about two and a half times more than the serum. The chloroform is not combined with the hæmoglobin, but with the lecithin and cholesterin of the corpuscles. A larger proportion was found in the brain than in the blood, and Pohl believes that the chloroform is retained by the cholesterin, lecithin, cerebrin and other substances very soluble in chloroform. The liver contained less than the blood and only traces were found in the urine. A less quantity was present in the fat than in the blood, which may be attributed to the scanty blood-supply of adipose tissue. Chloroform appears to be absorbed most rapidly and abundantly by tissues rich in substances which are soluble in that liquid. After administration has ceased the chloroform is reabsorbed by the blood and eliminated by the kidneys. Upon the nervous system the effects are very positive. Chloroform first affects the brain, then the sensory part of the spinal cord, then the motor tract, then the sensory parts of the medulla oblongata, and finally the motor portion of the medulla, thereby producing death from failure of respiration unless the heart has already succumbed to the drug.

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* *British Medical Journal*, October 11, 18, and 25, 1890.

Death from syncope not infrequently happens from chloroform before complete anæsthesia has been produced. Such accidents are from three to four times more common from chloroform than from ether. According to Sir Benjamin Ward Richardson, chloroform causes death in one of four ways: by apnœal syncope, by epileptiform syncope, by cardiac paralysis and by shock. That the toxic action of chloroform depends largely upon the presence of impurities is shown by the experiments of Du Bois Reymond. The residue left after the separation of pure chloroform by Pictet's process was found to exert a much more powerful influence upon the circulation and respiration than the purified product.

**Therapy.**—Chloroform is used as a local sedative, antiseptic, and counter-irritant, and, owing to its solvent action upon the alkaloids, it is a useful vehicle for anodynes. The solution of gutta-percha in chloroform (liquor gutta-perchæ) is sometimes used as a protective in smallpox and erysipelas. This is likewise a useful application in psoriasis, herpes zoster, superficial burns, furuncles, and fissured nipples. Chloroform is an excellent hæmostatic and promptly checks superficial hæmorrhage when applied upon lint or absorbent cotton. A lotion containing chloroform is often of service in urticaria, and a liniment made with chloroform, aconite, and camphor soothes the pain of neuralgia and chronic rheumatism:—

| | |
|---|---|
| ℞ Chloroformi, | |
| Tinct. opii, | |
| Tinct. aconit., | āā f℥ss. |
| Liniment. saponis, | f℥iiss. |

M. Sig.: For external application.

Another good formula for a local anæsthetic is that devised by Dr. Parsons:—

| | |
|---|---|
| ℞ Chloroformi, | fʒiij. |
| Tinct. aconit., | fʒiij. |
| Tinct. capsici, | fʒj. |
| Tinct. pyrethri, | fʒss. |
| Ol. caryophylli, | fʒss. |
| Camphoræ, | ʒss. |

M. Sig.: For external use.—The camphor is first dissolved in the chloroform and the oil of cloves and the tinctures are then added.

Chloroform may also be used, as suggested by Southworth, in the following combination to overcome a rigid perineum in labor:—

| | |
|---|---|
| ℞ Chloroformi, | f℥ij. |
| Ætheris, | f℥j. |
| Spiritus odorat., | Oj. |

M. Sig.: Apply locally.

This mixture acts quickly and well, large heads passing the perineum with no tear, which without it seemed impossible unless followed with extensive rupture.

Dobisch * recommends a combination containing pure chloroform as a spray for its local anæsthetic effect in minor surgical operations, incision of a paronychia, evacuation of a glandular abscess, extirpation of a superficial epithelioma, as follows:—

| | |
|---|---|
| ℞ Mentholi, | ʒj. |
| Chloroformi, | fʒx. |
| Ætheris, | fʒxv.—M. |

The local anæsthesia lasts from two to six minutes.

Internally it is useful in gastralgia as chloroform-water, or in combination with anodynes, as in chlorodyne.† It has also been given in hysteria, asthma, irritable cough, and sea-sickness.

Chloroform-water has been found serviceable in spasmodic croup. A few drops of chloroform, taken in water or upon sugar, will often relieve vomiting when not due to inflammation of the stomach. Chloroform-water is often of service in alleviating the vomiting of pregnancy. Chloroform, in 12- to 20-drop doses, is said to promote a rapid disappearance of the albuminuria and anasarca of pregnancy. Small doses of chloroform mitigate the pain and check the vomiting caused by gastric ulcer. In this condition it is beneficially combined with bismuth. Chloroform internally administered, relieves the paroxysms of whooping-cough. In diarrhœa, spirit of chloroform is beneficially added to a mixture containing astringents and opium. The chill of intermittent fever may often be averted by the administration of a drachm of the spirit of chloroform. The same preparation, given alone or in combination with morphine, allays hiccough.

The microbicide action of chloroform makes it serviceable in some cases of flatulent and fermentative or infectious dyspepsia. It has even been claimed to be useful in cholera in this way.

Dr. Werner has used chloroform in 130 cases of typhoid fever. It had a favorable influence upon the diarrhœa and tympanites and lessened the nervous manifestations. None of the patients died or

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* *Allgemeine Medicinische Central-Zeitung*, No. 14, 1890.

† CHLORODYNE.—The following formula is given by Oldberg and Wall as a good substitute for Collis Browne's chlorodyne:—

CHLOROFORMI MISTURA HYDROCYANATA (COMPOUND CHLOROFORM MIXTURE).

| | | |
|---|---|---|
| ℞ Morphinæ sulphat., | | gr. iv. |
| Ol. menthæ piperita, | | gr. viij |
| Ætheris, | | |
| Alcoholis, | āā | gr. cliv. |
| Acid. hydrocyanic. dil., | | f℥v gr. lxxxvj. |
| Chloroformi purificat., | | f℥iii gr. ccxxx. |
| Syrupi, | | f℥xvij. |

Dose, ♏v-x.

suffered a relapse. He employed a 1-per-cent. aqueous solution, of which he gave 1 or 2 drachms every hour or second hour, increasing the intervals as improvement occurred. Steep also reports good results from its use in typhoid fever.

The spirit of chloroform is used with especial advantage in the treatment of cholera morbus, and often for its sedative action upon the system.

The spirit of chloroform can be advantageously combined and used with aromatics and other remedies :—

| | | |
|---|---|---|
| ℞ Spiritus chloroformi, | | f℥ss. |
| Aquæ camphoræ, | | |
| Spiritus ætheris comp., | āā | f℥ij. |
| Tinct. capsici, | | fʒij. |

M. Sig.: A dessertspoonful in water, whenever necessary, for cholera morbus or in stomach-ache or intestinal pains or flatulence.

| | | |
|---|---|---|
| ℞ Spiritus chloroformi, | | fʒv. |
| Creosoti, | | ♏vj. |
| Spiritus ammon. arom., | | fʒij. |
| Aquæ menth. pip., | q. s. ad | f℥v. |

M. Sig.: A teaspoonful or two before meals for nausea or vomiting.

| | | |
|---|---|---|
| ℞ Spiritus chloroformi, | | f℥ss. |
| Morphinæ sulphatis, | | gr. j. |
| Aquæ cinnamomi, | q. s. ad | f℥iv. |

M. Sig.: From one to two teaspoonfuls every half hour for after-pains or in nervous or hysterical attacks.

In fevers, the spirit of chloroform is useful to relieve restlessness and irritative cough in pneumonia, bronchitis, or pleurisy, usually given in a "fever-mixture" combination.

**Special Application.**—The important application of this remedy is for producing anæsthesia during surgical operations. It is the most pleasant, the most active, and the most convenient anæsthetic. Unfortunately, its death record is so much higher than that of its great rival, sulphuric ether, that most surgeons in this country prefer to use the latter, although its odor is not agreeable, and it requires a much larger quantity to produce unconsciousness, and it has a preliminary state of excitement or intoxication. (Remarks upon the state of anæsthesia and the choice of anæsthetics may be found under the head of Ether.)

**The Administration for Anæsthetic Effect.**—The administration of chloroform for surgical operations requires skill and experience. The greater number of fatal cases, by far, have occurred in the hands of those who do not appreciate the responsibility they assume in using this powerful agent. The method to be followed is, first, to eliminate all cases of weak or diseased heart; and, if the operation is to be a long one, requiring prolonged administration of the anæsthetic, cases of kidney disease must also be excluded. The patient should not be in a sitting posture, nor should the chloroform be administered soon after a full meal. The clothing about the neck and waist should be loose enough to allow respiratory movements, but the patient should not be too much exposed, on account of the lowering of temperature and the possibility of congestion of the lungs or kidneys subsequent to the administration. The chloroform should be pure, and about 40 minims to a drachm poured upon a napkin or towel and held a little distance above the patient's nose or mouth, so that the dense vapor in falling shall mix with air.

According to Clover, the chloroform-vapor should be diluted with 20 volumes of air, and he has devised a special inhaler designed to accomplish this dilution. An improved apparatus, now in use, is known as Dr. Junker's inhaler. In many cases full anæsthesia, or coma, is not needed for small operations, parturition, passage of gall-stones, etc.; consciousness may be preserved while the sense of pain is abolished. Dr. Sayre, of New York, uses a much smaller amount of chloroform (5 to 20 drops), but administers the vapor in as concentrated a form as he can, avoiding the admission of air as far as possible, and speaks very confidently of the efficiency and safety of this method. The patient's pulse should be watched during the administration of chloroform, and, if it suddenly drops or becomes fluttering, Nelaton's method should be at once employed, in which the patient is placed in a vertical position, with the head downward, while artificial respiration is employed, which is usually successful. Amyl nitrite or ammonia inhalations should also be practised; or ether, digitalis, or whisky injected hypodermically. Efforts at resuscitation should not be discontinued in less than one hour, as patients have recovered after artificial respiration had been continued for this length of time. The faradic current is likely to do more harm than good, as it interferes with other measures, and if applied to the phrenic nerve may cause stoppage of the heart by inhibitory action. Slapping the chest with the fringe of a towel wet with cold water was the favorite resource of the elder Gross.

Sir Benjamin Ward Richardson regards artificial respiration as the most important measure for the relief of chloroform narcosis. Mouth to mouth insufflation may be practised in the absence of an apparatus, but an ordinary bellows can be utilized in emergencies.

Digitalis, hypodermically injected, is a valuable agent in combating the depressant effect of chloroform upon the heart. Dr. H. C. Wood advises the conjoined use of strychnine on account of its stimulant influence upon the circulation, and particularly upon the respiration. He believes that small amounts of alcohol are valueless, while large quantities assist the paralyzing action upon the heart. When danger threatens, the angle of the jaw should be raised and the tongue drawn forward, so that no mechanical impediment shall be offered to free respiration. In the Göttingen clinic, König's method of intermittent compression is practised in a modified form. The præcordium is rapidly and forcibly compressed at the rate of 120 or more per minute. The air-passages must at the same time be sedulously kept free. From the history of reported cases this appears to be an efficient means of resuscitation.

In administering chloroform, it is important to gain the confidence and co-operation of the patient, because struggling and resistance often disturb the judgment and lead to the employment of a larger quantity than is desired. Chloroform ought never to be administered rapidly, for the sudden entrance of a small quantity into the circulation is more dangerous than the gradual absorption of a larger quantity. In major operations, before the administration of the chloroform, it is customary with surgeons to give the patient 1 or 2 ounces of whisky as an arterial and cardiac stimulant. The administration of a dose of nux vomica in the form of tincture or of strychnine as a guard against accident is recommended by Milne and Wigglesworth. Chloroform is also often administered by inhalation for the relief of infantile and puerperal convulsions. In puerperal tetanus the inhalation of chloroform is a valuable measure. A combination of chloroform, given in this manner, and chloral, administered by the mouth in large doses, has been especially praised.

The paroxysms of whooping-cough are checked or moderated by this agent. About $\frac{1}{2}$ drachm may be poured upon the hand of the mother and held near the child's nose, or it may be vaporized by means of hot water, 2 or 3 drops being used for each year of the child's age. Used in the latter manner, four times daily, it is said to shorten the paroxysmal stage. In severe cases of chorea, in which the convulsive movements interfere with deglutition and rest, chloroform inhalations answer a very good purpose by inducing sleep, which is followed by notable improvement. Administered at first three times a day, and less often as the symptoms improve, this plan is said to cure the disease, on an average, in twenty-eight days. Chloroform is of value in painful delivery, not given so as to produce unconsciousness, but merely to blunt the sensibility. Used in this way, the uterine contractions are not weakened nor the danger of post-partum hæmorrhage increased. Chloroform is better borne by women in labor than by any other class of subjects. But if pushed to anæsthesia the contractions become less vigorous and hæmorrhage is favored. It is asserted that the inhalation of chloroform for a few minutes at a time, several times a day, is beneficial in phthisis, relieving the cough and reducing the temperature. For this purpose, Fraser recommends also the hypodermic injections of atropine (gr. $\frac{1}{120}$–$\frac{1}{60}$) with morphine hydrochlorate (gr. $\frac{1}{12}$–$\frac{1}{8}$); for the latter Dr. Laborde substitutes narceine.* In sciatica, Bartholow has given deep injections of 10 to 20 minims of chloroform, near the sheath of the nerve. In some cases this method has also afforded marked relief in facial neuralgia.

### CHLORUM.—Chlorine.

*Preparations.*

*Aqua Chlori* (U. S. P.).—Chlorine-Water (0.4 per cent. chlorine). *Dose*, largely diluted, f℥i–v.

*Calx Chlorata* (U. S. P.).—Chlorinated Lime (35 per cent. of available chlorine). *Dose*, gr. iii–vj.

*Liquor Sodæ Chloratæ* (U. S. P.).—Solution of Chlorinated Soda. *Dose*, ♏x–f℥j, largely diluted.

**Pharmacology.**—Chlorine is a gaseous element, more than twice the density of air, of a greenish color, strong and suffocating odor, irrespirable and, even in a state of dilution, very irritating to the air-passages. For disinfecting purposes, it may be disengaged by adding hydrochloric acid to manganese dioxide. Chlorine is soluble in water, and under the influence of sunlight slowly decomposes that liquid, combining with the hydrogen and setting the oxygen at liberty. Owing to the affinity for hydrogen, chlorine acts energetically upon organic substances, and often destroys them. Coloring matters of organic origin are bleached when exposed to its action. Chlorine is an efficacious disinfectant, decomposing hydrogen sulphide and destroying putrefying material. It also destroys the infectious miasms in the air, but should be in excess and in a closed room in order to be very effective. The generation of chlorine in the same room with patients is of very little use so far as disinfection is concerned. The combination with lime (chlorinated lime, or bleaching powder) is largely used for disinfecting drains and cesspools.

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* *Therapeutic Gazette*, September, 1890, p. 639.

For the sick-room, the solution of chlorinated soda (Labarraque's solution) is more convenient and less offensive, for use in commodes, bed-pans, etc., or for internal administration. The inhalation of ammonia gas is antidotal to chlorine when absorbed by the air-passages, ammonium chloride resulting from their combination. In cases of accidental poisoning from swallowing a chlorine solution, albumin, in the form of milk, eggs, or flour, is the best remedy at our command.

**Physiological Action.**—Chlorine gas, in concentrated form, when directed upon the skin, causes smarting and redness, followed by erysipelatous or pustular inflammation. It is a disinfectant, destroying parasitic vegetable growths. The inhalation of dilute chlorine is irritating to the lungs and stimulates the end organs of the pneumogastric nerve, causing coughing and strangling sensations. Internally, chlorine was formerly given in various infectious diseases, but this is rarely done at the present day, although Labarraque's solution or (freshly prepared) chlorine-water has decided influence in maintaining the stomach in an aseptic state during low forms of fever.

**Therapy.**—In the form of solution, chlorine is used to clean offensive ulcers and to remove patches of pityriasis. This liquid is also an excellent disinfectant to sloughing wounds, and may be injected into abscess-cavities, sinuses, or fistulæ, for the purpose of removing and neutralizing unhealthy or decomposing pus.

Schmidt-Rimpler praises the action of chlorine water as an antiseptic in operations upon the eye. He has found it especially useful in cases of dacrocystitis. In plastic operations upon the lids, traumatisms of the eye, corneal suppuration and serpiginous ulcer irrigations with chlorine water, several times a day, have given satisfactory results. This liquid has the advantage that it does not, like corrosive sublimate, produce corneal infiltrations after the installation of cocaine, but prevents suppuration without injuring the cornea. Chlorine water was found to be less irritant to the conjunctiva than the mercuric chloride and when kept in closely stoppered bottles, excluded as much as possible from the influence of the air and light, remains stable and active for some weeks. It is fit for use as long as it presents the characteristic odor of chlorine. Prior to the operation the conjunctival cul-de-sac and globe are washed with chlorine water, and when completed the lids are covered with muslin compresses wet with chlorine water and cotton sterilized with corrosive chloride, the whole being fixed by a sterilized bandage.* As an antiseptic wash, it may be employed in puerperal metritis. One part of Labarraque's solution to 10 or 12 of water is a useful injection in vaginitis. The same solution may be used as a prophylactic against poison from bites of serpents or insects. Chlorinated oil*—that is, olive-oil saturated with chlorine—is a very efficient remedy in scabies. It acts without irritating the skin.

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* See *Buffalo Medical* and *Surgical Journal*, May, 1892.

A compound known as chlorphenol has been experimentally employed as a local application in erysipelas, in the form of a 1-, 2- or 3-per-cent. ointment. The results are said to have been excellent. It is thought that the remedy would be more efficacious if given by subcutaneous injection.

A preparation called chlorophenique is highly praised by Dr. J. E. Chambers, of Saint Louis, as a valuable lotion to ulcerated mucous surfaces, as the mouth, nose and throat or as an injection into the vagina, uterus, bladder or rectum, in an inflammatory or ulcerated condition of those organs. A 10- or 20-per-cent. solution was employed. The evaporation of the gas likewise renders the fluid a serviceable disinfectant. Dr. Burney Yeo has had good results from the use of chlorine water in typhoid fever. Labarraque's solution may be similarly used, much diluted with water. The sore throat of scarlet fever is also benefited by the same methods. Gangrene of the mouth or tongue is likewise amenable to the same influence. According to some observers chlorine water has an action upon the liver and is useful in chronic disease of that organ.

The solution of chlorinated lime† of the British Pharmacopœia is one of the best antidotes to hydro-sulphuric acid, ammonium sulphydrate, potassium sulphide, and hydrocyanic acid (given in doses of ♏xx–f℥j). Sheets wrung out of this solution may be wrapped around the body of a person dead of infectious disease or in a decomposing condition. Chlorine gas has been utilized by Dr. Diver in the treatment of chronic ulcers of the leg. A piece of absorbent cotton was charged with the gas by being placed in a bottle containing about 2 drachms of potassium chlorate, and a drachm or more of hydrochloric acid. The cotton was laid upon the ulcer, covered with gutta-percha tissue and secured by a bandage. The Shurley-Gibbs plan of treating pulmonary tuberculosis consists in the inhalation of chlorine gas and the hypodermic injection of gold and sodium chloride. The gas may be evolved from chlorinated lime, from ½ to 6 drachms being spread out in a shallow dish and from 1 to 3 drachms of diluted hydrochloric acid added, stirring with a wooden spoon or spatula. It is best to begin with ½ drachm of chlorinated lime, increasing the quantity each day until 3 or 4 drachms are used. During inhalation of the gas the atmosphere of the room should be charged with a spray of saturated solution of sodium chloride. The patient should breathe through the nose, as cough is thus less likely to be excited. The time during which the gas is respired is at first about two minutes. This period is gradually lengthened to twenty or thirty minutes. In mild cases and in laryngeal phthisis the inhalation of chlorine water suffices.

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* "Chlorinated oil." See paper by the author, *Medical Bulletin*, 1884, p. 271.

† The strength of this solution is one avoirdupois pound of chlorinated soda to the imperial gallon.

At the Harper Hospital, Detroit, Mich., a face inhaler is used in carrying out this part of the treatment. Chlorine inhalations seem to be of value in arresting the progress of caseation.

Hypodermic injections are used for the purpose of avoiding chemical changes of the agents employed. The gluteal region is selected as the site of operation. The dose of iodine generally used at first is $\frac{1}{12}$ grain daily, increasing gradually until $\frac{1}{2}$ grain and in some cases 1 grain is reached. The gold and sodium solution is then injected daily, beginning with $\frac{1}{30}$ or $\frac{1}{20}$ grain and ascending until a dose of $\frac{1}{5}$ grain or $\frac{1}{3}$ grain is attained. At this point the quantity should be diminished to $\frac{1}{10}$ grain daily if the treatment is to be continued. At this stage it is considered better to alternate the injections. If albuminuria occur the iodine should be suspended. Little or no tendency to hæmoptysis has been observed. Catarrhal manifestations and fever may, in the beginning of the course, be temporarily aggravated, but improvement is said to follow. In some instances, anorexia, listlessness, diarrhœa and asthmatic symptoms result. Iodine alone cannot be long continued. The alternate use of the remedies prolongs the effect of the iodine. It is recommended that, as a rule, the alternate use should begin in the second or third week of the course, gradually decreasing their use to once or twice a week.* The authors of this therapeutical method have, in a number of cases, witnessed improvement as regards symptoms with diminution of physical signs and disappearance of bacilli from the sputum.

**CHONDRUS** (U. S. P.).—**Chondrus.** (Irish Moss.)

**Pharmacology and Therapy.**—Irish moss, or carrageen, is Chondrus crispus and Gigartina mamillosa (Algæ) bleached and dried by exposure to the sun. It is in hard, translucent, yellowish-white fragments of seaweed, with characteristic odor and saline, mucilaginous taste. It contains iodine and bromine in small quantities; its principal constituent is mucilage, but it contains no starch.

Irish moss contains a peculiar principle called carrageenin, which is distinguished from gum by not being precipitated from its watery solution by alcohol, and from starch by not turning blue upon the addition of tincture of iodine. Boiled with milk and water (℥j in Oj) and properly sweetened with white sugar and flavored, it makes blanc mange; or, in more dilute decoction (ʒiv to Oiij), a demulcent drink for the sick. It has not much food value, but is deemed useful in bronchial affections.

**CHOPPARO AMARGOSO.**

**Pharmacology and Therapy.**—Chopparo amargoso is a small, thorny bush (Simarubaceæ) which grows in Southwestern Texas. It bears pink flowers and red fruit. All parts of the plant have an intensely bitter taste. It seldom creates nausea, has no effect upon the bowels and seems to be eliminated principally by the kidneys, as its odor is perceptible in the urine. It possesses also some antiperiodic virtues. In large doses it causes flushing of the face and a sense of fulness in the head. Dr. J. W. Mixon, of Wrightsboro, Texas, reports that he has obtained excellent results from the administration of chopparo in dysentery, and suggests that it might prove useful in typhoid fever as an intestinal antiseptic and tonic. A fluid extract of chopparo amargoso has been prepared by Sharpe and Dohme, of Baltimore, the dose of which, as a tonic, is from 10 minims to half an ounce, and as a stimulant from 3 drachms to 1 ounce. The plant yields its virtues to boiling water and is frequently given in the form of a decoction.

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* *Therapeutic Gazette*, April 15, 1891.

**CHRYSAROBINUM** (U. S. P.).—**Chrysarobin.**
**Dose**, gr. $\frac{1}{8}$-xx.

*Preparation.*

*Unguentum Chrysarobini* (U. S. P.).—Ointment of Chrysarobin (15 per cent., with benzoinated lard),

**Pharmacology.**—Chrysarobin is a neutral principle in its commercial, more or less impure form, commonly misnamed chrysophanic acid, extracted from goa-powder, a substance found deposited in the wood of the trunk of Andira araroba (Leguminosæ), a native of East Indies and Brazil. It is an orange-yellow powder, odorless and without taste, nearly insoluble in water and in alcohol, but soluble in ether, sulphuric acid, and solutions of alkalies.

**Physiological Action.**—In comparatively large doses (ʒss) it causes irritation of the intestinal mucous membrane, and gives rise to vomiting and purging, with large, bilious stools.

It excites inflammation of the skin from its local application, and produces a yellowish-brown stain of the skin and clothing. (The stain is removable with a weak solution of chlorinated lime or soda). It is said that hot benzol will remove the discoloration from hair and clothing, provided that no soap or alkali has been used. A yellowish hue is communicated to the urine by chrysarobin. This color turns red upon the addition of alkalies. The dermatitis may be diffuse, or expressed by follicular and furuncular eruptions. Chrysarobin is parasiticide, and destructive to epiphytic organisms.

**Therapy.**—The principal internal use of chrysarobin is for its cathartic action. It has been administered internally, in doses of gr. $\frac{1}{8}$, several times daily in psoriasis. But its extremely irritant effect upon the intestinal mucous membrane so soon compels its abandonment that it is practically valueless as a systemic remedy. When applied externally for a considerable period, a small portion may probably act by absorption. Chrysarobin ointment should not be allowed to come in contact with the healthy skin, but, in psoriasis, the disease for which it has been principally employed, should be carefully rubbed into the affected area. The parts should then be covered by a bandage in order to protect the linen. Another method of applying chrysarobin is by making a paste of it by means of water, rubbing the paste upon the patches after the scales have been removed, allowing the mixture to harden and, finally, penciling collodion over the surface.

Chrysarobin is curative by its stimulating action on psoriasis, chronic acne and vegetable parasitic skin diseases; but the official ointment should be diluted several times before application, for fear of exciting too much inflammatory reaction. Chronic eczema and the second stage of rosacea also receive benefit from chrysarobin ointment. The same preparation has sometimes proved of service in lupus vulgaris.

A very good combination in chronic eczema and psoriasis is the following:

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|---|---|
| ℞ Olei cadini, | fʒss. |
| Chrysarobini, | gr. xx. |
| Unguent. zinci oxidi, | ℥j.—M. |

A 5-per-cent. solution in liquor guttæ perchæ has been used with advantage in chronic eczema and a 10-per-cent. solution in psoriasis. Dr. Dale James writes that the most cleanly manner of employing chrysarobin is by dissolving 1 part in 7 parts of chloroform, and stirring about an equal quantity of soft petroleum into the mass. The preparation is applied by means of a brush. Chrysarobin has been recommended by Dr. Robinson, of New York, as an excellent application in alopecia circumscripta. It may be conveniently used in the form of a stick, made up according to the following formula slightly modified from that given by Dr. Leistikow, of Hamburg:—

| | |
|---|---|
| ℞ Chrysarobini, | ℥j. |
| Colophonii, | ʒj. |
| Ceræ flav., | ℥j. |
| Ol. olivæ, | ℥j.—M. |

**CIMICIFUGA** (U. S. P.).—**Cimicifuga, Black Snake-Root, Black Cohosh, Actæa.**

**Dose**, gr. xx–xxx.

*Preparations.*

*Extractum Cimicifugæ Fluidum* (U. S. P.).—Fluid Extract of Cimicifuga. *Dose*, fʒss.

*Extractum Cimicifugæ* (U. S. P.).—Extract of Cimicifuga. *Dose*, gr. i–v.

*Tinctura Cimicifugæ* (U. S. P.).—Tincture of Cimicifuga (20 per cent.). *Dose*, fʒi–ij.

*Decoctum Cimicifugæ.*—Decoction of Cimicifuga (℥i–Oj). *Dose*, fʒvi–℥iss.

*Macrotin.*—An impure resin. *Dose*, gr. ss–ij.

**Pharmacology.**—The rhizome and rootlets of Cimicifuga racemosa (Ranunculaceæ), a plant common in woods in Northern United States, contain a neutral principle of acrid taste, soluble in dilute alcohol, water, chloroform, or ether. Its chemical nature is not known positively. Mr. Geo. H. Davis has discovered a volatile oil in the recently gathered roots; and Prof. Geo. B. Wood thought that this might be the active principle, since the drug deteriorates upon keeping. It also contains two resins. So-called cimicifugin, or macrotin, is an impure resin, deposited from the concentrated tincture upon the addition of water. There is also in the recent drug, besides the volatile oil, some tannic and gallic acids. The odor of the plant is rather fetid.

**Physiological Action.**—Cimicifuga has decided effects upon the human system. Small doses stimulate the digestive function and increase secretions along the alimentary canal. The secretions of the bronchial mucous membrane are also increased, the action of the heart stimulated, and the urine is augmented in quantity. The menstrual flow is increased, and some aphrodisiac qualities have been ascribed to the drug. Upon the heart and circulation an effect is noticed resembling that of digitalis, though less marked. Full doses slow the pulse and increase its force, raise arterial tension and stimulate uterine contraction; the latter action recalls that of ergot, though it is less powerful. Cimicifuga lowers the reflex activity of the spinal cord. The pupils are dilated; dimness of vision, vertigo, intense headache, nausea, and vomiting result from large doses. Even soporific effects have been observed, with relief from pain or spasm. Death may be caused by failure of respiration.

**Therapy.**—The applications of cimicifuga are in accordance with its physiological activity. Externally, a saturated tincture is said to relieve pain in rheumatism and neuralgia. In chorea it is of decided value, especially in weak, anæmic children. It is, moreover, very applicable to those cases which manifestly depend upon rheumatism, or to those which develop in girls at the age of puberty and are associated with menstrual irregularity. In neuralgia, especially when the consequence of rheumatism, cimicifuga is of undoubted benefit. In certain cases of sciatica improvement follows the administration of this agent.

A formula of Dr. Metcalf for sciatica is:—

℞ Tr. aconit.,
Tr. colchic. sem.,
Tr. belladonn. fol.,
Tr. cimicifugæ, . . . . . . . . . . āā f℥ij.
M. Sig.: Six drops every six hours.

It was introduced into England by Sir J. Y. Simpson as a remedy for chronic rheumatism, myalgia, and hypochondriasis with depression. Cimicifuga is beneficial in melancholia, especially when that condition is associated with functional or organic uterine or ovarian disorder. Cimicifuga is likewise serviceable in some cases of acute rheumatism, and Ringer has found it useful in rheumatoid arthritis. The fluid extract is the best and most reliable preparation. In uterine subinvolution, ovarian neuralgia, and amenorrhœa, it is highly commended. It has a good effect, also, in other constitutional manifestations dependent upon disorder of the female generative system, as, for instance, convulsions caused by disturbance of the catamenial function, and in puerperal mania. Congestive dysmenorrhœa is likewise relieved by this remedy. Cimicifuga is often beneficial in menorrhagia and metrorrhagia. By reason of its action upon the womb, cimicifuga may be employed during parturition as a substitute for ergot. Though not so powerful as the latter drug, it strengthens the normal uterine contractions. For its tonic effects, it is used in treating gastric catarrh and irritable stomach of alcoholism; also in delirium tremens and functional impotence. In weak and fatty heart it is safer than digitalis. On account of its stimulating effects upon the uterus, it should not be given during pregnancy.

In headache from eye-strain, cimicifuga has been given with benefit, and is especially useful in acute bronchitis as an expectorant. Cimicifuga is likewise valuable in chronic bronchitis attended by profuse purulent secretion. It may even be serviceably prescribed in phthisis, as it facilitates expectoration, sustains the appetite and digestion and reduces fever.

Cimicifuga may be administered in the appended formulæ:—

℞ Ext. cimicifugæ fl., . . . . . . . . . . f℥iss.
Tinct. nucis vomicæ, . . . . . . . . f℥j.
Tinct. cinchonæ comp., . . . . . . q. s. ad f℥v.
M. Sig.: A teaspoonful or two in water every three or four hours. For ovarian and uterine neuralgia and amenorrhœa.

℞ Ext. cimicifugæ fl., . . . . . . . . . . f℥j.
Morphinæ sulphatis, . . . . . . . . . . gr. j.
Spiritus ætheris nitrosi,
Liquor. ammonii acetatis, . . . . . . āā f℥ij.
M. Sig.: Two teaspoonfuls in water every three or four hours. For neuralgia, acute rheumatism, and acute bronchitis.

℞ Ext. cimicifugæ, . . . . . . . . . . gr. xxiv.
Ext. belladonæ folior. alc., . . . . . . . . gr. j.
Pulv. capsici, . . . . . . . . . . . gr. xij.
M. et ft. pil. no. xij.
Sig.: From one to two pills three times a day. For gastric catarrh, delirium tremens, and functional impotence.

**CINCHONA** (U. S. P.).—**Cinchona, Peruvian Bark.**
**Cinchona Rubra** (U. S. P.).—Red Cinchona.
**Dose,** ʒi–iss.

### *Preparations.*

*Infusum Cinchonæ* (U. S. P.).—Infusion of Cinchona (6 per cent., 1 per cent. sulphuric acid and water). *Dose,* f℥ss–iij.

*Extractum Cinchonæ* (U. S. P.).—Extract of Cinchona. *Dose,* gr. i–x.

*Extractum Cinchonæ Fluidum* (U. S. P.).—Fluid Extract of Cinchona. *Dose,* ♏x–fʒij.

*Tinctura Cinchonæ* (U. S. P.).—Tincture of Cinchona (20 per cent.). *Dose,* ♏xxx–fʒij.

*Tinctura Cinchonæ Composita* (U. S. P.).—Compound Tincture of Cinchona (cinchona 10, bitter orange-peel 8, serpentaria 2, glycerin 7.5, alcohol and water, q. s. ad 100 parts). *Dose,* fʒi–iv.

### *Alkaloids and Salts.*

*Quinina* (U. S. P.).—Quinine. A white, amorphous powder, soluble in 1600 parts water and in 6 parts alcohol. *Dose,* gr. i–ʒj.

*Quininæ Sulphas* (U. S. P.).—Quinine Sulphate. *Dose,* gr. i–ʒj. In snow-white, loose, filiform crystals, fragile, and in a light, easily-compressible mass; lustreless (owing to superficial efflorescence), odorless, having a persistent bitter taste and neutral reaction. Soluble in 740 parts of water, and in 65 parts of alcohol at 15° C. (59° F.), in small proportions of acidulated water. Very slightly soluble in ether. Aqueous solution, especially if acidulated with sulphuric acid, has a vivid, blue fluorescence. When treated first with fresh chlorine-water, and then with slight excess of water of ammonia, the salt produces an emerald-green color (*thalleioquin*). Crystals are formed of the same color by treating an acidulated solution of quinine sulphate with saturated alcoholic solution of iodine (*herapathites*).

*Ferri et Quininæ Citras* (U. S. P.).—Iron and Quinine Citrate (contains 12 per cent. of quinine, 85 of ferric citrate). *Dose,* gr. ii–x.

*Ferri et Quininæ Citras Solubilis.*—Soluble iron and quinine citrate. *Dose,* gr. iij–x.

*Vinum Ferri Amarum* (U. S. P.).—Bitter Wine of Iron. *Dose,* fʒi–ij.

*Quininæ Bisulphas* (U. S. P.).—Quinine Bisulphate. *Dose,* gr. i–xv. Similar to the sulphate, but much more soluble, dissolving in 10 parts of water or 32 parts of alcohol at 59° F.

*Quininæ Hydrochloras* (U. S. P.).—Quinine Hydrochlorate. *Dose,* gr. i–xv. Soluble in 34 parts of water.

*Quininæ Hydrobromas* (U. S. P.).—Quinine Hydrobromate. *Dose*, gr. i–xx.

*Quininæ Valerianas* (U. S. P.).—Quinine Valerianate. *Dose*, gr. i–xx.

*Cinchonina* (U. S. P.).—Cinchonine. *Dose*, gr. v–xxx. White crystals, almost insoluble in water. Has an alkaline reaction. Tasteless at first, afterward bitter.

*Cinchoninæ Sulphas* (U. S. P.).—Cinchonine Sulphate. *Dose*, gr. v–xxx. In white needles, soluble in 70 parts of water and in 8 parts of alcohol. Very bitter.

*Cinchonidinæ Sulphas* (U. S. P.).—Cinchonidine Sulphate. *Dose*, gr. v.—xl. Similar to preceding, but less soluble.

*Quinidinæ Sulphas* (U. S. P.).—Quinidine Sulphate. *Dose*, gr. v–xxx. Similar to the preceding.

*Chinoidinum.*—Chinoidine. *Dose*, gr, iii–xxx. A mixture of the alkaloids, in an amorphous form, and dark colored; obtained from the residue left from the manufacture of the crystallizable salts.

*Quininæ Hydrochloras Carbamidata.*—Double Salt of Quinine and Urea. Soluble in an equal part of water, and used hypodermically in congestive chills. *Dose*, gr. i–x.

*Quinetum*, or Hospital Quinine, is the mixed alkaloids precipitated by an alkali; largely used as a febrifuge in India. *Dose*, about the same as quinine.

*Cinchonidinæ Salicylas.*—Cinchonidine Salicylate. *Dose*, gr. ii–x.

*Cinchonina Iodosulphas.*—Cinchonine Iodosulphate (50 per cent. iodine). A substitute for iodoform.

**Pharmacology.**—Cinchona. The pharmacopœia recognizes the bark of any species of cinchona (Rubiaceæ) containing at least 5 per cent. of its peculiar alkaloids; but, of the many varieties of quinine-bearing trees, two are most important: Cinchona flava, which is the bark of the trunk of Cinchona calisaya, containing at least 2 per cent. of quinine; and Cinchona rubra, the bark of the trunk of Cinchona succirubra, containing at least 2 per cent of quinine. There have been isolated from cinchona-bark about twenty alkaloids, differing slightly in physical qualities, solubility, reaction, and affinities, but all possessing, to greater or less degree, the characteristic physiological actions of quinine. They may be divided into two groups: (1) quinine, quinidine, and quinicine; (2) cinchonine, cinchonidine, and cinchonicine. They exist in the bark combined with cincho-tannic, kinic, and kinovic acid, with a tasteless, inactive substance,—cinchona-red. While South America remains the principal source of cinchona, yet the cultivation of the tree has been successfully carried on in India and Java, and a considerable portion of the supply is now derived from this source. The constantly-growing demand for quinine has stimulated chemical investigation; and laboratory products, chiefly of the coal-tar series, are now offered in great variety, that closely approach the cinchona alkaloids in physical and chemical characters, and also have been proven valuable as antipyretics. Prominent among these are chinoline, antipyrin, acetanilid, resorcin, salicylic acid, naphthalin, which are considered separately under their individual titles. Thus far, however, no synthetically-prepared salt rivals quinine and cinchonine in their control of malarial manifestations, or in their tonic effects upon the system when given for a length of time in small doses.

M. Grimaux has succeeded in producing quinine synthetically by availing himself of a chemical modification of cupreine, a base found in the Remijia pedunculata, a plant which contains none of the cinchona alkaloids. MM. Grimaux and Arnaud have, by synthesis, obtained from cupreine a substance absolutely analogous to natural quinine. They have also derived from cupreine other bodies similar to quinine. These are ethers of cupreine and are endowed with decided physiological properties. Quinine is chemically the methylic ether of cupreine. By a similar process to that by which cupreine is transformed into quinine, two new alkaloids have been discovered. Ethylic cupreine has been denominated quinethyline and propylic cupreine has been given the name of quinopropyline.

With regard to the comparative alkaloidal value of the bark, the C. calisaya contains the greatest proportion of quinine, the C. succirubra the greatest amount of tannin and coloring matter. Under the name of pale bark, the C. micrantha and C. condaminea were formerly official; they are intermediate between the two just named, in their alkaloidal value. The C. pitayensis, cuprea-bark, and other quinine-yielding barks are employed in manufacturing the alkaloids, but are not specifically named by the pharmacopœia; all are official which contain at least 5 per cent. of the total alkaloids of cinchona. A delicate test for quinine is the production of a bright green color when a solution of one of its salts is treated with chlorine water followed by the addition of a little aqua ammonia.

Quinine sulphate is a snow-white crystalline substance of a silky lustre, which becomes somewhat opaque in dry air from efflorescence. It becomes yellowish on exposure to sunlight, is phosphorescent on trituration at 320° F. At a red heat it decomposes and burns slowly without any residue. This salt is soluble in 740 parts of cold and 30 parts of boiling water, is readily soluble in alcohol and acidulated solutions, and in glycerin. It dissolves sparingly in chloroform and is nearly insoluble in ether.

**Physiological Action.**—The preparations of the bark are not fully represented by the salts of the alkaloids because they possess astringency, which is absent from the latter, and because the physiological action is increased by the association of different principles in accordance with the well-known rule of combination of synergistic remedies. The bulk of the powdered bark is inconveniently large. In 1820, Pelletier and Caventou first isolated quinine, which has since taken the leading place in therapeutics of fever, and is second only to morphine in importance. As the other salts approximate more or less closely to this, we may omit consideration of their physiological action and simply take quinine as the type.

Quinine is a powerful antiseptic, and is very destructive to infusorial and vegetable life. A solution of 1 grain to the ounce destroys micro-organisms, and double this strength prevents fermentation and putrefaction. Upon the basis of his numerous experiments, Binz concludes that the remedial action of quinine in malaria is due to its direct action upon the specific micro-organism of the disease. Upon the sound skin very little effect is, as a rule, produced, but upon a part denuded of epidermis, or upon mucous membranes, it is a decided irritant. Rashes, however, may be caused by the direct action of cinchona. Workmen employed in making quinine are not infrequently attacked by erythema, vesicles or pustules. It causes muscular contractions when applied directly to the muscle, but not when applied to a nerve (Eulenberg). It is therefore a muscle-irritant and not a nerve-irritant. Taken into the stomach, it exercises a local effect upon its contents, checking abnormal fermentation and destroying infectious micro-organisms. For this purpose it should be given in solution or in powder (capsule), so as to insure its solution in the stomach. In moderate doses, it stimulates the muscular fibres of the stomach, increasing its motor power, and also by its irritant action increases the secretion of gastric juice and, as a bitter tonic, improves the appetite. In large quantities, hunger is abolished, and the excess of irritant action causes arrest of gastric secretion.

In excessive doses it may cause nausea and vomiting. Its prolonged use in large amounts has been known to cause gastritis. No influence has been noticed upon respiration, and very little upon temperature of a person in health. In conditions of fever, the administration of several full doses reduces the temperature nearly to the normal; and there appears to be a tolerance during this condition, for the system can stand a much larger quantity at a dose than it can in health, without producing toxic effects. This may, in part, be due to the fact that absorption is checked by the fever. The effect upon the nervous system of small doses is best seen in cases of debility, where the agent acts as a tonic, invigorating the vital functions and aiding the digestion and assimilation of food. In larger doses, symptoms referable to the brain are noticed, such as fullness, frontal headache, deafness, ringing in the ears, and mental dullness. These symptoms are attributed to partial anæmia of the brain, owing to contraction of blood-vessels and lowered heart action, possibly to direct action upon the multipolar cells, analogous to the action of morphine. There is stimulation of the sympathetic and auditory nerves (Gubler). With deafness there is associated disturbance of vision or temporary blindness, due to extreme contraction of the arterioles and anæmia of the retina, the optic nerve being perfectly white, resembling white atrophy. This condition of the eye-ground is more or less permanent, but the function of vision is restored. Amblyopia has been produced in an extremely susceptible individual by so small a dose as 2 grains.

Large doses lower or abolish the reflex excitability of the spinal cord. Soon after being introduced into the stomach it diffuses into the blood and may be detected in the urine, elimination taking place slowly and lasting for several days. The quantity of urine is slightly increased in persons unaccustomed to its effects; the uric acid is decreased and urea not constantly affected. Medicinal, and especially massive, doses of quinine have, however, been observed to cause a marked decrease in urea and it is thought that the diminished elimination of nitrogenous waste depends upon a depressant influence exerted by this drug upon tissue-changes within the body. Full doses of quinine may cause congestion of the genito-urinary tract.

Quinine probably escapes from the system by other routes, as it has been detected in the sweat, tears, and milk of nursing women. It has been found also in bile and in dropsical effusions. In the blood, quinine arrests the migration of the white corpuscle and checks its amœboid movements; the red cells are rendered less adhesive and their oxygen-carrying function is imparied. The experiments of Sokoloff upon rabbits show that quinine exerts a favorable influence upon the healing of wounds. Inflammatory degeneration of tissue is notably decreased. It probably tends to destroy infectious micro-organisms in the blood and tissues. The pulse-rate is increased by moderate doses, but larger ones (ʒi–iss) cause lowering of the pulse and of arterial tension. In animals, death results from paralysis of respiration after large doses of quinine. In the human subject few well-attested cases of death from the ingestion of quinine are on record. Recovery has followed the use of such enormous quantities as half an ounce or an ounce and a half, though it is very probable that in such cases the entire amount was not absorbed. In Bazire's case, death was caused by 5 ounces taken in the course of ten days. In some patients various forms of eruption have been noticed upon the skin; even purpura* occasionally follows. A scarlatiniform eruption occasionally follows the ingestion of a small dose of quinine. In other instances the eruption has resembled that of measles or erysipelas. Desquamation is a sequence and may be prolonged. The rash is often attended by severe burning and itching sensations.

The artificial alkaloids exert a more decided influence upon temperature, causing a reduction of several degrees in healthy individuals. When injected subcutaneously these substances give rise to total anæsthesia of the neighborhood into which they are thrown Cupreine is slightly toxic and does not occasion convulsions. Quinethyline produces tremor and the symptoms of quinine intoxication. Quinopropyline is the most toxic member of the series and causes a profound stupor.

**Poisoning.**—The toxic symptoms produced by quinine and allied salts are spoken of collectively as **Cinchonism,** which ordinarily is not allowed to go farther than tinnitus aurium. Where these symptoms are annoying, or the patient is suffering from an overdose, the alimentary tract should be cleared by a purge and brandy and a cup of hot coffee administered, or a dose of ergot. Hydrobromic acid (fʒss–ij), given with quinine, prevents the occurrence of ringing in the ears or headache. Some patients show idiosyncrasy to the effects of quinine; urinary irritation, even congestion of the kidneys and hæmorrhages, may follow quite a small dose. Some, indeed, cannot take a single grain without great inconvenience from cinchonism. It must, therefore, be given with caution when cystitis is present. Quinine will also, in some individuals, occasion decided irritation of the gastro-intestinal mucous membrane.

A case has lately been reported by Dr. Krannhals in which the administration of 3 grains of quinine to a young woman was followed by high fever, bloody vomiting and bloody diarrhœa. Erlenmeyer has recently described a case in which the nervous reflexes were greatly exaggerated after the administration of a single dose of 15 grains of quinine, followed by 30 grains in broken doses on the succeeding day. Examination of the patellar reflex at that time occasioned a series of general convulsions with violent contraction of the arms and the entire body. Where there is much irritation of the skin, urticaria, or erythema, a warm bath containing sodium bicarbonate is useful; a hypodermic injection of morphine may be necessary. Quinine is eliminated rather slowly and principally by the kidneys.

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* Cases by Dr. Frank Woodbury reported to State Medical Society of Pennsylvania, *Philadelphia Medical Times*, September 18, 1886.

**Therapy.**—The application of powdered bark was formerly one of the accepted methods of treatment of ulcers, but is now obsolete. A 1-per-cent. solution of quinine sulphate is recommended as a topical treatment of sluggish, unhealthy infected wounds. The powdered salt, dusted upon chancroids, has been found to promote rapid healing.

In hay fever, a spray of cocaine, followed by a spray of quinine hydrochlorate (gr. vi–f℥j), used frequently, is highly recommended. A solution of quinine sprayed into the throat is attended with good results in diphtheria. Quinine has also been used as an injection in gonorrhœa for its antiseptic action. In a similar way, Garretson employs it as a paint in cases of erysipelas to limit the spread of the disease:—

℞ Quininæ sulphat., . . . . . . . . . . ʒij.
Tincturæ ferri chloridi, . . . . . . . f℥ij.
Tincturæ cinchonæ, . . . . . . . . f℥j vel f℥iss.

M. Sig.: Apply with a camel's-hair pencil. In using this preparation, the affected part is to be painted and repainted until it turns black. The application may have to be made from a dozen to fifty times. So long as redness of any surface or any point of a surface shows through the black, the cure is incomplete. The quantity of cinchona tincture used is graduated by the state of the skin; coarse skin requiring less, tender skin more.

In cystitis, irrigation of the bladder with a 2-per-cent. solution prevents decomposition of the urine. The hypodermic injection of quinine is of great value in pernicious malarial attacks and in sunstroke. The best salts for this purpose are the neutral hydrochlorate, the hydrobromate, or the carbamid-hydrochlorate, the solution being freshly made and filtered and a perfectly aseptic syringe being used, as otherwise abscess or septicæmia, or even tetanus, may follow. The crystallized bisulphate may also be employed. Freshly precipitated quinine lactate, which is soluble in four times its weight of water, is well adapted to hypodermic use as giving rise to little pain. The crystallized salt, however, is soluble only in 16 to 20 parts of water.

As an ordinary tonic, in conditions of debility or convalescence, the tincture of the bark, either simple or compound (the latter being more astringent), is more useful than the alkaloids, for reasons already stated, and because the alcohol in the tincture is synergistic. The usual dose of either tincture is 1 or 2 drachms, as a tonic, and of quinine 2 grains, three times daily. In cases of diarrhœa, the antiseptic action of cinchona is very valuable, and quinine is of service in typhoid fever, especially during the second week; but it does not approach the character of a specific, as it does in malarial attacks.

Some writers praise the action of quinine in summer diarrhœa and cholera morbus, and suggest that it would prove efficacious in Asiatic cholera. Professor Fullerton has strongly recommended its use in cholera, giving it in doses of 15 or 20 grains in the course of two hours at the beginning of the attack. He values it likewise as a prophylactic remedy.

In ordinary chills and fever, 16 grains daily of the sulphate or bisulphate, or 12 of the hydrochlorate or hydrobromate, given in two or three doses, at least five hours before the time of the expected paroxysm, will generally prevent its appearance, or greatly modify it. The treatment should be continued for a week or ten days, diminishing the dose, or suspending it, if cinchonism appear, but resuming the full dose at septenary periods, after the appearance of the last chill, for a month or more. The following prescriptions may be used in malaria:—

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| ℞ Quininæ sulphatis, | ʒij. |
| Acidi sulphurici arom., | fʒj. |
| Ol. menth. pip., | ♏v. |
| Ext. glycerrhizæ fl., | f℥j. |
| Glycerini, | f℥iv. |

M. Sig.: A teaspoonful or two every three or four hours.

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|---|---|
| ℞ Quininæ sulphatis, | |
| Ferri pyrophos. solubil., | āā gr. xl. |
| Acidi arsenisi, | gr. j. |
| Pulveris capsici, | gr. xx. |
| Aloini, | gr. ij. |

M. et ft. pil. no. xx.
Sig.: A pill three or four times a day.

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|---|---|
| ℞ Tinct. cinchonæ comp., | f℥iv. |
| Tinct. nucis vomicæ, | fʒj. |
| Extracti taraxici fl., | |
| Ext. cascaræ fl., | āā f℥ij. |

M. Sig.: A half to a tablespoonful in water three or four times a day.

A patient once poisoned by malaria may find it necessary to take a course of quinine for several weeks each year, at the season when the attack first appeared; and if unacclimated persons, wishing to stay in a malarious locality, or traveling through one at certain seasons of the year, will make use of the prophylactic action of quinine they may escape infection by taking from 4 to 6 grains daily. Dr. John B. Hamilton considers cinchonine preferable to quinine for this purpose. In children, as well as in adults having a weak or irritable stomach, it is more convenient to administer the remedy in suppositories of cacao-butter, on account of the bitter taste and unpleasant effects on the digestion. The taste of quinine is tolerably well disguised by milk, and, as Dr. F. E. Stewart suggests, by coffee prepared with milk and sugar, the dose to be followed by a sip of coffee which contains no quinine. Ringer states that an equal portion of powdered ginger conceals the taste of quinine. In enlargement of the spleen (ague-cake) quinine is very efficient in moderate-sized doses. In intermittent fever it is not given during the paroxysm, because its irritant action may increase the nervous disturbance; but in other fevers pyrexia is no contra-indication to its use. In infectious diseases, hæmorrhagic measles, small-pox, diphtheria, and pyæmia, quinine combined with alcohol is the chief reliance.

This drug quite favorably influences the broncho-pneumonia of measles and counteracts the tendency to caseous degeneration. It is a serviceable remedy in children in lobular pneumonia dependent upon other causes. Combined with iron, quinine is very serviceable in erysipelas. Ten grains of quinine, given with Dover's powder, opium, or morphine, is efficient in averting an attack of acute catarrh. The same quantity of quinine given at the beginning will sometimes abort acute tonsillitis and prevent the formation of pus. As quinine checks the principal phenomenon in inflammation and suppuration, which is the escape of the white blood-cell, and by preventing the exchange of oxygen by the red blood-cells reduces inflammation, it is especially serviceable in pneumonia and other localized inflammations, and also in reducing discharge from abscesses and preventing sapremia or pyæmia. Bartholow considers that a larger dose—from 20 to 40 grains—has the power, if administered during the congestive stage, before exudation has occurred, of suppressing a croupous pneumonia, pleurisy, or endocarditis.

In this country, quinine is rarely, if ever, given in doses of several drachms, as it has been in Germany, for the purpose of reducing high temperature in erysipelas, scarlatina, or rheumatism, although Liebermeister regards it as being a better antipyretic than the cold bath. It is not considered advisable to use such large amounts in typhoid, on account of the inflammation of the patches in the small intestine. In typhoid and other fevers it may be administered in the following manner, especially if the action of the heart be weak:—

℞ Extract. cinchonæ fl., . . . . . . . . . fʒvj.
Tinct. cardamom. comp., . . . . . . . . f℥iv.
Spiritus ætheris comp., . . . . . . . . f℥j.
Tinct. digitalis, . . . . . . . . . . f℥ij.
Aquæ chloroformi, . . . . . . . . ad f℥x.
M. Sig.: A half to a tablespoonful every three or four hours.

In whooping-cough, which is regarded by some as a parasitic infection, its use has been attended by much benefit in comparatively large doses, conjoined with the local use of a spray of quinine solution (Henke).

In many disorders of atonic character, such as neuralgia, dyspepsia, night-sweats of phthisis, general debility, neurasthenia, quinine is highly serviceable. It is particularly valuable in those manifestations of neuralgia which result from anæmia or malaria, and is well combined in the former case with iron, and in the latter with arsenic, thus:—

℞ Quininæ sulphatis,
Massæ ferri carbonatis, . . . . . . āā ʒss.
Ext. nucis vomicæ, . . . . . . . . gr. iij.
Ext. belladonnæ folior. alc., . . . . . . gr. j.
M. et pil. no. xij.
Sig.: A pill three or four times a day.

℞ Quininæ sulphatis, . . . . . . . . ʒj.
Arseni sulph.,
Ext. ignatiæ alc., . . . . . . . . āā gr. ij.
M. et ft. pil. no. xx.
Sig.: A pill three times a day.

Dr. St. John Roosa has called attention to the dangers of the abuse of this drug, its causing many serious disturbances of the ear, even when taken in small, though long-continued doses. Professor Charcot recommended the administration of quinine in Menière's disease. His method was to give 6 grains twice daily at meal-time for fifteen days. The drug is then discontinued for eight days, when it is resumed in the same manner.

The noises in the ear and the vertigo may be aggravated at first, but this effect soon subsides. Four or five such periods of alternate exhibition and discontinuance generally result in a cure. Many skin disorders and eruptions are due to malaria, as pointed out by the late Dr. L. P. Yandell, in which quinine produces good effects. In old malarial cases the sulphate of cinchonine or cinchonidine may be substituted for the more expensive quinine salts:—

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|---|---|
| ℞ Chloroformi, . . . . . . . . . . | ♏xxx. |
| Cinchonidinæ sulphas, . . . . . . . | gr. xlviij. |
| Tinct. cardamom. comp., . . . . . . . | f℥ij. |
| Mucilaginis acaciæ, . . . . . . . q. s. ad | f℥iv. |

M. Sig.: Take a dessertspoonful every four hours, for malarial toxæmia.

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|---|---|
| ℞ Chinoidini, . . . . . . . . . . | ʒj. |
| Cinchonidinæ sulph., . . . . . . . | gr. xl. |
| Piperinæ, . . . . . . . . . . | gr. vj. |
| Cupri sulphat., . . . . . . . . . | gr. ij. |

M. et ft. pil. vel capsulæ no. xxx.
Sig.: One or two every three or four hours in congestive chills.

Other evidences of chronic malarial intoxication, as diarrhœa, dysentery, jaundice, and chorea, disappear under the administration of quinine. Intermittent hæmaturia, due generally to the same cause, is cured by large doses of quinine. In view of its irritant effect upon the genito-urinary system, quinine will sometimes excite or aggravate hæmaturia in those suffering from malaria. This fact should be remembered in the management of malarial hæmaturia. Small doses of quinine, temporarily employed, are useful in cases of catarrh of the stomach, whether due or not to alcoholic excess. Its action is aided by association with a mineral acid. Quinine is an excellent remedy in aphthous ulceration consecutive to enterocolitis, and in the yeasty vomiting produced by the growth of sarcina ventriculi. The same agent is of utility in the treatment of ascarides and tænia, not by virtue of a direct toxic influence upon the parasites, but by correcting the unhealthy condition of the intestinal mucous membrane which favors their development. Tonic doses of quinine render excellent service in delirium tremens. The laryngismus stridulus to which rickety children are subject is ameliorated by quinine hydrobromate. In many skin diseases dependent upon lowered nutrition,—as, for instance acne, impetigo, or ecthyma,—small, daily doses of this remedy are beneficial. Quinine is of value as a support to the system during the course of a prolonged suppuration; and a full dose is prudently given before the use of a catheter or bougie, in order to prevent the occurrence of a chill. It is an excellent tonic in bronchorrhœa. Good results have been claimed by certain French physicians from the use of quinine in acute rheumatism, but the experience of most observers is unable to confirm these reports. It is of more decided benefit in chronic rheumatism, especially when occurring in aged or debilitated subjects. In these cases it is best given in conjunction with the tincture of iron, or in the form of salicylate, or with potassium iodide:—

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|---|---|
| ℞ Quininæ sulphatis, . . . . . . . . . | ʒj. |
| Tinct. ferri chloridi, . . . . . . . . | f℥j. |
| Elix. cascaræ sagradæ, . . . . . . . | f℥iv. |

M. Sig.: Two teaspoonfuls three or four times a day.

| | |
|---|---|
| ℞ Potassii iodidi, | ʒ vij. |
| Spiritus chloroformi, | f℥ ij. |
| Tinct. cinchonæ comp., | f℥ x. |

M. Sig.: A half to a tablespoonful in water three or four times a day.

**Special Applications.**—In obstetrics, quinine is valued as an oxytocic, increasing the energy of the uterine contractions, though not capable of inciting them. Abortion has been produced by the administration of quinine and strychnine as a tonic, the accident being attributable to the latter agent. Quinine is also useful in preventing putrid infection from the uterine discharges, in the treatment of so-called milk fever (a mild septicæmia) or milk-leg, and also in cases of uterine subinvolution after parturition. In small doses it stimulates the menstrual flow and acts as an emmenagogue. In anæmic patients it may be given combined with iron:—

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|---|---|
| ℞ Ferri et quininæ citratis, | ʒj. |
| Ol. tanaceti, | ♏x. |

M. et div. in pil. no. xx.
Sig.: One four times daily, or two morning and night.

**Warburg's tincture** is highly prized in England in fevers, and in shock or collapse. Each ounce contains quinine, 10 grains, in combination with aromatics, half of the quantity being given at a dose and the remainder in three or four hours.* Its administration is to be preceded by a brisk purgative. In severe cases of poisoning by malaria, large doses are absolutely necessary to save life when given by itself, but when given in the above combination much smaller quantities are found to answer the purpose.

**Cinchonine Iodosulphate** is the precipitate resulting from the addition of a solution of iodated potassium iodide (Bouchardat's reagent) to a watery solution of the cinchonine sulphate. It is collected and washed free from iodine, and dried. The resulting product is an amorphous, impalpable powder, of a brownish color, without odor, insoluble in water, though soluble in alcohol or chloroform. The dose of this preparation is from 1 to 5 grains. The interesting point in connection with it is that it contains 50 per cent. of iodine. M. Ivon (*Le Progrès Médicale*, July 12, 1890) has recently completed some studies upon the antiseptic qualities made with this agent, which, on account of its effects, he styles **Antiseptol**, and recommends as a substitute for iodoform on account of the low price and superiority as a surgical dressing.

Cinchonine iodosulphate has the action of the two substances that enter into its combination, being at the same time free from the toxic effect which follows sometimes from the use of iodoform. Externally it has been used by the writer for its antiseptic action with excellent results, especially in the treatment of chronic ulcers, sinuses, abrasions, lupus vulgaris, abscesses, chronic acne, and various inflammatory thickenings of the integument. The following formulæ may be recommended:—

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* The National Formulary has the following formula for Warburg's tincture, under the name of *Tinctura Antiperiodica* (N. F.): Rhubarb, angelica-seed, āā gr. 56; elecampane, saffron, fennel, āā gr. 28; aq. extract of aloes, gentian, zedoary, cubeb, myrrh, white agaric, camphor, āā gr. 14; quinine sulphate, gr. 160; dilute alcohol, q. s. ad Oj. M. *sec. art.* Or the formula may be prescribed *without aloes.*

℞ Cinchoninæ iodosulphatis, . . . . . . . , ʒj.
Ungt. zinci oxidi, . . . . . . . . . , ℥j.
M. For chronic acne, eczema, and psoriasis.

℞ Cinchoninæ iodosulphatis, . . . . . . . . ʒj.
Ol. eucalypti, . . . . . . . . . . ♏x.
Lanolini, . . . . . . . . . . . ℥j.
M. For syphilis, chronic ulcers, and eczema.

The author's attention has been directed to this preparation by Dr. Frank Woodbury, who has employed it largely in the treatment of consumption and many systemic affections in which antiseptics are indicated. It has been used with advantage in place of iodoform, iodol, or aristol, or in those cases in which these agents are not well borne. Woodbury has given from 1 to 5 grains of the drug in phthisis, three or four times a day, and the author has also administered similar doses with marked benefit in the treatment of scrofuloderma, lupus vulgaris, psoriasis, chronic eczema, secondary and tertiary syphilis. Cinchona iodosulphate has both a tonic and an alterative action upon the system. At this time the author has several cases of the different diseases alluded to upon this drug, with a most decidedly good effect.

**Dextro-Quinine** is probably an impure quinidine (Wood).

**Contra-Indications** to the use of quinine consist in :—

1. Idiosyncrasy, where nervous disturbances, headache, skin eruptions, purpura, are caused by small doses, and where this cannot be overcome by the use of bromides, ergot, or arsenic.

2. Acute inflammation of the genito-urinary tract or congestion of the kidneys.

3. Acute inflammations of the gastro-intestinal tract.

4. Inflammation of the middle ear and dullness of hearing (nervous deafness).

5. Infants suffering with eczema.

It is stated on the authority of Brown-Séquard and Albertoni that quinine and cinchonidine increase the frequency of epileptic convulsions.

The comparative antiperiodic value of the alkaloids is thus estimated by Bartholow: Quinidine is first as an antiperiodic; quinine comes next. Cinchonine requires about twice the dose in order to equal quinine. Cinchonidine is a little stronger than cinchonine. Amorphous chinoidine is about one-fourth the strength of quinine. As already stated, Dr. J. B. Hamilton prefers cinchonine sulphate as a prophylactic to quinine sulphate. In the United States Army the hydrochlorate is generally given the preference over the sulphate on account of its greater solubility. The hybrobromate and valerianate are supposed to cause less nervous irritation in susceptible subjects than the other salts. The addition of a few drops of dilute sulphuric acid to quinine sulphate makes it much more soluble; or, the disulphate may be prescribed in pill form in the same doses as the sulphate. The borate, carbolate, and salicylate have been introduced as especially serviceable in neuralgia, but possess no special advantage sufficient to compensate for their higher cost. Quinine sulphovinate is a very soluble salt, requiring only twice its weight in water to dissolve it, and might be used hypodermically. M. Grimaux has recently succeeded in producing some new double salts of quinine, the hydrochloro-sulphate, the hydriodo-sulphate and the corresponding phosphates.

The hydrochloro-sulphate is a granular, grayish-white, amorphous powder and has an extremely bitter taste, is soluble in its own weight of water, is equal in strength to the sulphate, than which it is more rapid in its action on account of being more readily absorbed. The physiological and therapeutical effects are the same as those of the sulphate. Its solubility renders it particularly serviceable for hypodermic use.

Cinchonamine, a new derivative of quinine, has been studied by M. Arnaud, who finds that it has as marked an effect and is more soluble than quinine. Cinchonamine is obtained from cuprea bark. It is said to be six times more toxic than quinine, is possessed of but slight antiseptic power, reduces abnormal temperature and may be serviceable in malaria. It is said to exert a decided sialogogue influence.

Clinical experiments with the salts of the synthetical alkaloids have been carried on by Professor Bourru, of Rochefort. The hydrochlorate of cupreine is efficient in malaria, but must be given from the beginning in doses of 15, 24 or 30 grains. This salt produced no ill effects. It was without influence upon the pulse. The sulphate of quinethyline appears to be superior as an antiperiodic to quinine. It was employed in maximum doses of 12 grains. The sulphate of quinopropyline is the most energetic member of the series. In a case of typhoid fever it produced a marked reduction of temperature. A dose of 8 grains gave rise to buzzing in the ears, vertigo, nausea and general malaise. It is active in about half the dose of quinine.*

**Quininæ Tannas.**—The tannate is sometimes called "tasteless quinine," because the bitterness is almost entirely overcome by the combination, largely because of insolubility of the salt. Although insoluble in water, it is soluble in the acid gastric juice, and when administered with food, or soon afterward, it answers equally well with the other salts. In the combination with sweet chocolate all objectionable taste is overcome, and, made into troches, or compressed tablets, each containing 1 grain, we have a sort of confection, probably the very best form in which to administer quinine to children. It may be made extemporaneously :—

| | | |
|---|---|---|
| ℞ | Quininæ, . . . . . . . . . . . | gr. xxiv. |
| | Acidi tannici, . . . . . . . . . . | gr. xij. |
| | Syrupi cinnamomi, . . . . . . . . . | f℥ iij. |

M. Each drachm contains one grain of quinine. If the quinine sulphate is used the tannic acid must be doubled.

| | | | |
|---|---|---|---|
| ℞ | Quininæ hydrochlorat., . . . . . . . . | | gr. xxiv. |
| | Acidi tannici, | | |
| | Glycyrrhizin. ammoniat., . . . . . . . | āā | gr. xij. |

M. Divide in chartæ no. xij.
Sig.: Three daily.

| | | |
|---|---|---|
| ℞ | Quininæ sulphatis, . . . . . . . . . . | gr. xxiv. |
| | Elixir glycyrrhizin. ammon., . . . . . . . | f℥ iij. |

M. Sig.: A teaspoonful to a tablespoonful, according to circumstances.

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* *La Tribune Médicale*, July 5, 1894; *The Medical Bulletin*, September, 1894, p. 349.

The ammoniated elixir of glycyrrhizin is a good excipient for the sulphate which is suspended in the mixture. No acid should be added when the extract is used.

An adult can take a powder of quinine in a dessertspoonful of syrup of red orange, or syrup of wild cherry, without experiencing much unpleasant taste. Some prefer to take it in a little whisky and water. Other preparations which may be used with more or less success in order to disguise the taste of quinine are cascara cordial and the aromatic syrup of yerba santa. When given in powder, quinine may be rendered nearly tasteless by rubbing up with one-fourth its weight of ammoniated glycyrrhizin. The sugar-coated or gelatin-coated pills are most commonly used, and, if properly made (and if they contain the full amount of the drug), they answer all ordinary demands. In cases of irritability of the stomach and diarrhœa it is better to use the remedy in the form of a solution. Pure cinchonine may be serviceably employed instead of quinine, especially in the treatment of children. Cinchonine is effectual in malaria and does not occasion buzzing in the ears, though it gives rise to a sensation of dryness in the nose and mouth and may cause paresis of accommodation with alteration in the size of the pupil.

The tannate of quinidine is also almost tasteless and may be used with advantage in dyspepsia, diarrhœa, and nephritis.

**CINNAMOMUM** (U. S. P.).—**Cinnamon.**

**Dose,** gr. x–xxx.

*Preparations.*

*Oleum Cinnamomi* (U. S. P.).—Oil of Cinnamon. *Dose,* ♏i–iij.

*Tinctura Cinnamomi* (U. S. P.).—Tincture of Cinnamon. *Dose,* f ʒ i–iv.

*Aqua Cinnamomi* (U. S. P.).—Cinnamon-Water. *Dose,* f ℥ ss–iv.

*Spiritus Cinnamomi* (U. S. P.).—Spirit of Cinnamon. *Dose,* f ʒ i–ij.

*Pulvis Aromaticus* (U. S. P.).—Aromatic Powder (cinnamon, ginger, āā 35 parts; cardamom, nutmeg, āā 15 parts). *Dose,* gr. v–xxx.

Aromatic sulphuric acid, compound tincture of catechu, compound tincture of lavender, syrup of rhubarb, aromatic tincture of rhubarb, aromatic syrup of rhubarb, compound tincture of cardamom, chalk mixture, and wine of opium also contain cinnamon as a constituent.

**Pharmacology.**—Cinnamon is the inner bark of the shoots of Cinnamomum zeylanicum (Ceylon cinnamon), the bark of an undetermined species of Cinnamomum (Saigon cinnamon), or the bark of the shoots of one or more undetermined species of Cinnamomum grown in China, Cinnamomum cassia (Cassia cinnamon or Chinese cinnamon), large trees belonging to the natural order Laurineæ. Besides the volatile oil, which is used for flavoring purposes, cinnamon contains tannic acid, mucilage, coloring matter, an acid and lignin.

The Ceylon cinnamon is the choice variety, but the greater portion of this valued spice brought to this country is the cassia cinnamon, the flavor of which is less sweet and more pungent and astringent. The physiological properties are the same.

**Physiological Action.**—Cinnamon is an aromatic, with considerable astringency. It acts as a hæmostatic, not so much through its astringent constituents as by virtue of the volatile oil, which may be used efficiently alone.

**Therapy.**—In cases, especially among childen, where counter-irritation is needed, the use of a spice plaster is recommended, as in croup, colic, neuralgia, etc. They can be obtained already prepared for use, or may be prepared extemporaneously by placing aromatic powder between two layers of flannel and moistening it with hot whisky. As a stomachic, in flatulence and feeble digestion, cinnamon is of some value, but its carminative effect is most frequently utilized in combination with other remedies, especially purgatives, to prevent griping. It is of service in diarrhœa, as in the chalk mixture, to which other agents may be added:—

℞ Bismuthi salicylat., . . . . . . . . . . gr. i–iij.
Misturæ cretæ, . . . . . . . . . . fʒj.
M. pro dosi.

For irritative diarrhœa of infants, especially summer diarrhœa, this dose to be repeated according to urgency every hour or more.

Finely powdered cinnamon, given in doses of 1-1½ drachms, morning and evening, is said to be an efficient remedy in acute dysentery. It will at times be found capable of allaying nausea and vomiting, or even of relieving sea-sickness. In passive uterine hæmorrhage we may give an extemporaneous infusion in milk, or give the oil upon sugar. The oil may also be utilized, at least as an adjuvant, in pulmonary hæmorrhage.

Dr. J. C. Ross claims that large doses of cinnamon, internally administered, are of value in the palliative treatment of carcinoma of various internal organs. He states that pain is alleviated, the odor decreased and the general condition improved. Dr. Ross directs that from 11 to 13 ounces of Ceylon cinnamon be placed in 3 quarts of water, boiled down to a quart, and decanted without filtering. Of the mixture a pint is to be taken every twenty-four hours.

Various vegetable essences have been shown by M. Chamberland to possess marked antiseptic power. The essence of cinnamon has been utilized by M. Lucas-Championnière as a surgical dressing. Employed in full strength it is very irritant, but dissolved in retinol to form a pomade it constitutes an excellent application to sutured wounds after operations. Dr. J. Chalmers Da Costa, of Philadelphia, recommends the oil of cinnamon as an injection in gonorrhœa. He first cleanses the urethra by means of hydrogen dioxide, after which he injects the oil of cinnamon dissolved in one of the liquid petroleum preparations. The solution is made of the strength of 1 drop to the ounce on the first day, 2 drops to the ounce on the second day, and thenceforward 3 drops to the same quantity of menstruum. Spraying several times a day with the essence of cinnamon is said by Dr. Capsus to be of decided service in all forms of malaria, cases which had proved unamenable to quinine and arsenic improving within a few days. The following formulæ for antiseptic ointments have been published by M. Championnière:—

℞ Retinol., . . . . . . . . . . . . ℥ij ʒij.
Ceri sterilizat., . . . . . . . . . . ʒvj.
Cinnamol,* . . . . . . . . . . . ♏xv.

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* Cinnamol is the freshly distilled essence of cinnamon.

| | | |
|---|---|---|
| ℞ Retinol, | | ℥ij ʒij. |
| Ceri sterilizat., | | ʒvi. |
| Cinnamol, | | ♏xv. |
| Beta-naphthol, | | gr. xv. |
| M. | | |

| | | |
|---|---|---|
| ℞ Retinol et ceri, | | ℥iij. |
| Ess. cinnamomi, | | ♏xv. |
| Ess. origani, | | |
| Ess. geranii, | āā | ♏xl. |
| Ess. verbenæ, | | ♏xx. |
| M. | | |

| | | |
|---|---|---|
| ℞ Retinol et ceri, | | ℥iij. |
| Ess. geranii, | | |
| Ess. origani, | | |
| Ess. thymi, | | |
| Ess. verbenæ, | āā | ♏xxv. |
| M. | | |

## COCA (U. S. P.).—Erythroxylon.

### *Preparations.*

*Extractum Cocæ Fluidum* (U. S. P.).—Fluid Extract of Coca. *Dose*, ♏x–fʒj.
*Extractum Cocæ.*—Extract of Coca. *Dose*, gr. iii–xv.
*Vinum Cocæ.*—Wine of Coca. *Dose*, f℥ss—iv.
*Cocaina.*—Cocaine.
*Cocainæ Hydrochloras* (U. S. P.).—Cocaine Hydrochlorate. *Dose*, gr. ¼–ij.
*Cocainæ Oleas.*—Oleate of Cocaine.

**Pharmacology.**—Coca or cuca leaves, taken from the Erythroxylon coca (Lineæ), a small tree of Peru and Bolivia, contain a crystallizable alkaloid, **Cocaine**; a second alkaloid, **Hygrine,** which is liquid and volatile; and probably a third, also volatile, and only found in the recently-dried leaves, resembling the volatile oil in tea, the effects of which, and those of coca, are analogous. Coca-leaves are chewed by the natives to sustain their strength during long journeys and to invigorate them when fatigued, and the reports of travelers establish the truth of the observation, that with the assistance of a small quantity of the leaves they can endure privation from food and perform remarkable feats of endurance. The fact that the same effects cannot be obtained in this country from the imported dried leaves makes it probable that the fresh leaves contain a volatile principle of considerable physiological activity, which is lost after a sea-voyage, by partial fermentation and drying, as maintained by Dr. H. H. Rusby. They also contain cocatannic acid and some oil, aromatic and coloring matters, etc.; but cocaine is the most important constituent. As cocaine is decomposed into benzoic acid and ecgonine by the action of mineral acids, these should not be prescribed with the fluid preparations made from coca-leaves. A precipitate also results from a mixture of the solutions of sodium bromide and cocaine hydrochlorate. The salts of cocaine are incompatible with those of mercury. A mixture of cocaine and menthol is said to form a very irritant combination. Cocaine and silver nitrate are incompatible.

**Physiological Action.**—Coca and, to a marked degree, cocaine cause local numbness or anæsthesia when applied to mucous membranes and when injected hypodermically. When cocaine is applied to the conjunctivæ, sensibility is reduced, the pupils become dilated, and the accommodation impaired; it constricts the blood-vessels, diminishes the intra-ocular tension, causes enlargement of the palpebral fissure and protrusion of the eyeball. It occasions an irregularity of the corneal surface, or haziness, which does not appear, however, to depend upon loss of epithelium. When applied to the tongue, it causes numbness and loss of tactile sensibility without affecting the movements. The application of cocaine to the pharynx, or larynx, and nasal chambers, reduces the sensibility so as to permit manipulation or operation, and also by its effect upon blood-vessels reduces congestion and inflammation. Taken in small doses frequently repeated, coca acts as a general tonic and prevents waste. In somewhat larger doses it is a nerve-stimulant, increasing the blood-supply to the nerve-centres, improves the digestive powers, increases the force of the heart's action and arterial tension by its influence upon the vaso-motor centres and cardio-motor ganglia. It also gives a sense of well-being that enables the organism to bear more fatigue and to sustain the powers of the body with less food or less sleep than usual. Coca increases the flow of urine, but the quantity of urea is lessened; it thus acts as an indirect food by preventing waste. After an overdose the pulse becomes rapid and weak, respiration is labored and shallow, and oppression of the chest is complained of, with threatening collapse, clammy skin, hallucinations, and delirium. Clonic convulsions of cerebral origin are occasioned and the bodily temperature markedly increased. Death is due to the paralysis of the heart, the spinal centres, or the centres in the medulla. Diarrhœa is produced by large doses, with headache (Hammond). According to the studies of M. Maurel, coca has an action upon the leucocytes, causing them to become globular and rigid and to lose their property of adhering to the walls of the vessels. In this manner thrombi and emboli are formed and death is apt to result from pulmonary embolism. Gley has experimentally determined that the liver diminishes the tonicity of cocaine. In some cases of poisoning from cocaine albumin has been found in the urine.

**Poisoning.**—The treatment is the same as for toxic doses of caffeine. Morphine, atropine, chloral, amyl nitrite, and chloroform, alcohol or ether are physiological antidotes.

Ammonia and digitalis may likewise be made use of in order to counteract the milder toxic manifestations of cocaine. In severe cases Dr. S. Mitchell has employed with service a large teacupful of clear coffee, which can be administered cold or hot.* In some cases toxic effects have apparently been produced, with great depression and imminent collapse, by extremely minute doses, as where cocaine is used as a mydriatic, or applied to the throat. They can only be explained by idiosyncrasy, and the symptoms usually promptly disappear after the administration of stimulants, or the inhalation of ammonia or ether. A form of protracted acute cocainism has been lately described by Hallopeau, who has, in several instances, observed the injection of a single small dose to produce distressing symptoms, which may endure for several months. These symptoms bear much resemblance to those which immediately follow the injection, and consist, above all, of persistent headache, accompanied by profound malaise, insomnia, numbness of the limbs, vertigo, syncope, mental excitement, and loquacity.[*] **Cocainism,** or the evil results from constantly resorting to this drug as a stimulant, requires moral treatment more than medicinal; possibly the addiction may be, in some cases at least, the first manifestation of insanity. In a large number of cases, moreover, those who fall victims to the cocaine habit are also addicted to the use of morphine, the double intoxication leading to the most serious deterioration of health. Appetite and strength decrease, tremors and hallucinations occur, and insanity may finally supervene. Medicinally, cocaine addiction is most successfully treated by large doses of chloral or potassium bromide in combination with chloral. Cocaine is eliminated by the kidneys, much of it, however, being oxidized within the system.

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* *Western Medical Reporter*, September, 1892.

**Therapy.**—The introduction of cocaine to the profession as a local anæsthetic is due to Dr. Koller, who first called attention to its usefulness in eye-surgery in 1884. Since then its influence in causing local anæmia and dilatation of the pupil having been discovered, it is now one of the necessary drugs in eye-practice (a 4-per-cent. solution being the usual strength employed, as first recommended by Koller). Anæsthesia of the conjunctiva results in from one to five minutes after instillation of a solution of cocaine. Dilatation of the pupil does not occur until ten or twenty minutes after the instillation; it continues for about an hour, and then gradually disappears. Though impaired, the accommodation is not paralyzed, and is restored while the pupils yet remain dilated. The conditions of the eye in which cocaine is particularly applicable are diseases of the conjunctiva and cornea, accompanied by pain and photophobia. By its local anæsthetic properties it facilitates many of the operations upon the eye. The removal of foreign bodies imbedded in the cornea, the excision of pterygium, the cauterization of corneal ulcers, dilatation of the lachrymal canal, the operation for strabismus, staphyloma, or chalazion, iridectomy, and extraction of the lens may all be accomplished by the aid of cocaine anæsthesia.

According to Dr. Arthur G. Hobbs, of Atlanta,[†] cocaine should never be used when an abrasion of the cornea exists. He regards it as contra-indicated also in any corneal inflammation, and thinks that it should not be prescribed beyond the acute stage of any form of conjunctivitis. It is not so well adapted for use when enucleation of the eyeball is to be performed, though this operation may be done when the alkaloidal solution is injected deeply around the orbit. Mr. Leahy has found cocaine serviceable in gonorrhœal ophthalmia. He incorporates ½ grain of atropine sulphate and 4 grains of cocaine sulphate in 100 grains of vaseline (lard or lanolin the writer suggests as a better vehicle for the absorption of the drugs incorporated), and applies the mixture beneath the upper lids. Dr. P. Richard Taylor, of Louisville, esteems cocaine as superior to the mydriatics usually employed in the treatment of iritis. He advises its use in a concentrated form, as its effects in contracting the vessels limit its absorption. He is accustomed to employ a 25-per-cent.

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[*] *La Tribune Médicale*, December 4, 1890; *Medical Bulletin*, January, 1891.

[†] "The Uses and Abuses of Cocaine, with reference to Mucous Membranes especially." *The Southern Medical Record*, November, 1892.

watery solution or an ointment composed of 25 parts of cocaine to 100 parts of petroleum.

In aural surgery, a solution of cocaine may be introduced within the external meatus for the relief of acute and chronic purulent otitis, ulcers of the canal, or to render possible operative procedures within the tympanic cavity. The application of this solution to the lower nasal passages and the orifice of the Eustachian tube is a valuable assistance in catheterization of the tube through the nose. Dr. Ticano has reported a case in which a few drops of a 5-per-cent. solution of cocaine introduced through a catheter into the middle ear soon excited vomiting and diarrhœa which continued for several hours.

By injection of this remedy into the tube itself the inflation and injection of remedial liquids into the tube and the middle ear is rendered much easier of performance.

In chronic laryngeal tuberculosis Professor Moure makes use of the following combination applied by means of an atomizer:—

| | |
|---|---|
| ℞ Cocain. hydrochlorat., . . . . . . . | gr. iv–x. |
| Chloral. hydrat., . . . . . . . . | gr. xxx–xlv. |
| Potass. bromid., . . . . . . . . | gr. xxx–xlv. |
| Glycerin. pur., . . . . . . . . | f℥jss. |
| Aq. destillat., . . . . . . . . . | f℥vj. |

M. ft. sol. Sig.: To be used three or four times a day, from three to five minutes on each occasion.

In dental and nasal surgery this substance fulfills numerous indications. The local anæsthesia produced by cocaine permits operation for ingrown nails and the removal of intra-laryngeal tumors.

The rectal injection of a cocaine solution relieves the tenesmus and pain of dysentery. Used as an injection, or applied upon a pledget of cotton, cocaine allows many gynæcological operations to be painlessly performed. Vesico-vaginal fistulæ, laceration of the cervix uteri, and urethral caruncles have been successfully treated in this way without a resort to general anæsthesia. Cocaine likewise affords relief in vaginismus. Dilatation and curetting of the uterus, trachelorrhaphy, colporrhaphy and perineorrhaphy can likewise be performed in the same manner. A solution applied to the uterine neck may relieve rigidity during labor.

Dr. Corning, of New York, has shown that, by using the drug hypodermically and confining it within limits, a degree of local anæsthesia can be obtained that permits of large operations, such as removal of tumors, extirpation of the breast, or amputation of a limb. It is used as an injection into the urethra in gleet and previous to passage of instruments or surgical operations. The injection of a few drops of a 4-per-cent. solution into the urethra in case of stricture of large calibre may succeed in relieving retention of urine. In such procedures, however, it must be borne in mind that the urethral and rectal mucous membranes absorb with great rapidity, and a strong solution must, therefore, be avoided. Berger has reported a case of death, preceded by convulsions and coma, from injection of 7 grains of cocaine dissolved in a spoonful of water, the fluid being allowed to escape immediately and the entire quantity being apparently recovered. The symptoms were manifested very soon after the injection had been made.

In a case of cystitis produced by the absorption of cantharides Albarran resorted with advantage to the injection of a cocaine solution into the bladder. Urethral injections of cocaine are useful in relieving erethism. The application of a solution to the glans penis is beneficial in nocturnal enuresis dependent upon irritation of the glans or prepuce in growing boys.

Cocaine is employed as a spray or in wafers with gelatin, in the throat or nose for simple catarrh, pharyngitis, laryngitis, and for the relief of hay fever (4- to 20-per-cent. solution). Dr. Isidore Gluck avoids the toxic effects of a cocain solution that sometimes ensues by using the following formulæ:—

| | |
|---|---|
| ℞ Phenol., | ♏ij. |
| Aquæ destillatæ, | fʒj. |
| M. et adde | |
| Cocaine hydrochloratis, | gr. x. |

M. Phenol renders the solution aseptic and prevents absorption of the cocaine.

A chemical combination, cocaine phenate, has been more recently introduced and has been employed with advantage in most of the conditions where the hydrochlorate has proved useful. Cocaine phenate is a yellowish substance, of the consistency of honey. It melts readily when heated. It is soluble in alcohol. The dose is from $\frac{1}{12}$ to $\frac{1}{6}$ grain. It may be applied locally in solutions varying in strength from 1 to 10 per cent. When placed upon the tongue it obtunds both taste and tactile sensibility. It produces profound anæsthesia of the conjunctiva, with dilatation of the pupil, partial paralysis of accommodation, slight lachrymation and often temporary ptosis. Anæsthesia is of rather slower development than from the use of the hydrochlorate, but is of longer duration. The phenate, also, is much less apt to be absorbed and produce systemic effects. Cocaine phenate has been used in operations upon the throat and nose with advantage by Dr. D. B. Kyle.* Good results have likewise been reported from the use of this salt by Dr. C. A. Veasey and by German observers.

The following combinations are recommended†:—

| | |
|---|---|
| ℞ Cocain. phenat., | gr. iss. |
| Menthol., | gr. iv. |
| Alcohol. dilut., | fʒiiss. |
| M. Sig.: For inhalation in diseases of the larynx and bronchial tubes. | |
| ℞ Cocain phenat., | gr. iij. |
| Pul. acidi borici., | gr. xxx. |
| M. Sig.: For acute and chronic nasal catarrh. | |

Parker advocates a combination with resorcin in order to overcome the unpleasant or toxic effects which sometimes follow the application of strong solutions of cocaine to the nose or throat. The association of these drugs seems to add to the antiseptic and astringent action of the cocaine. Dr. Gauthier is accustomed to conjoin with the cocaine solution prepared for injection one drop of a 1-per-cent solution of nitroglycerin. He conceives that in this manner he is able to antagonize the influence of the cocaine upon the cerebral blood-vessels. Bignor asserts that acid solutions produce but little anæsthetic effect, and advises that the ordinary solutions should be rendered neutral. When an excess of sodium carbonate is added to such a solution the alkaloid is liberated and forms a finely divided mixture. He terms this suspension "milk of cocaine," and states that, when freshly made, it produces an excellent anæsthetic effect.

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* "Phenate or Carbolate of Cocaine as a Local Anæsthetic." *Therapeutic Gazette*, January 16, 1893.

† *Journal de Medicine de Paris.*

Dr. John Edwin Rhodes, of Chicago, makes use of a combination which he thinks intensifies the anæsthetic property of cocaine and perhaps hastens the anæsthesia. His formula is as follows:—

| | |
|---|---|
| ℞ Atropin sulphatis, | gr. ss. |
| Strophanthin., | gr. ⅕. |
| Cocain hydrochlorat., | gr. xx. |
| Acidi carbolici, | gr. v. |
| Aq. destillat., | q. s. ad f℥j. |

M.

This solution has, injected in doses of 2 to 8 minims, produced almost complete local anæsthesia without consitutional disturbance. It has also been used by means of an atomizer in the pharynx, larynx and nasal cavity.

In order to avoid throwing the cocaine into a vein, Magitot advises that it be injected into the substance of and not beneath the skin or mucous membrane. Except in the case of operations upon the head, the patient should be in a recumbent position when the injection is made. The dose should be in proportion to the extent of surface to be anæsthetized, but should never exceed 1¼ to 1½ grain. It is well to divide the dose into several portions, leaving an interval of several minutes between each injection. If toxic manifestations follow the first portion, further injection must be abandoned.

In making a solution of cocaine it is advisable to add a small quantity of a ½-per-cent. solution of boric acid, which promotes solubility and prevents decomposition.

An ointment or solution of cocaine has been employed for the purpose of relieving the pain of cracked nipples, but it has been found to have the further effect of diminishing the secretion of the milk. For the suppression of lactation, Dr. Joire, of Lille, recommends the application of a solution of 15 grains of cocaine in 2½ drachms each of water and glycerin.

An ointment containing coca or cocaine hydrochlorate is an admirable local remedy in affections characterized by severe pain or distressing itching. The extract of coca (gr. xxx–ʒj) may be incorporated in an ounce of lard, or the salt of the alkaloid may be used in the proportion of 4 to 8 or 10 grains to the ounce, or as follows:—

| | |
|---|---|
| ℞ Extracti cocæ,. | ʒss. |
| Creosoti, . | ♏v. |
| Ungt. zinci oxidi, | ℥j. |
| Ungt. plumbi subacetatis, | ʒss. |

M. For subacute eczema or psoriasis.

| | |
|---|---|
| ℞ Cocainæ, | gr. x. |
| Plumbi carbonatis, | ʒj. |
| Pulveris marantæ, | ʒj. |
| Ol. eucalypti, | ♏iv. |
| Ungt. zinci oxidi, | ℥j. |

M. Useful in acute eczema, dermatitis, burns, and irritable ulcers.

| | |
|---|---|
| ℞ Cocainæ hydrochloratis, | gr. xij. |
| Atropinæ sulphatis, | gr. j. |
| Acidi carbolici, | ♏v. |
| Ol. anthemidis, | ♏iv. |
| Ungt. zinci oxidi, | ℥j. |

M. For herpes, herpes zoster, dermatalgia, and paræsthesia.

| | |
|---|---|
| ℞ Extracti cocæ, | ʒj. |
| Zinci carbonatis, | ʒij. |
| Camphoræ, | gr. x. |
| Sulphuris sublimati, | gr. xx. |
| Ungt. aquæ rosæ, | ℥j. |

M. For eczema around the genital organs.

| | |
|---|---|
| ℞ Cocainæ hydrochloratis, | gr. x. |
| Mentholi, | gr. x. |
| Bismuth. subnit., | ʒj. |
| Ungt. zinci oxidi, | |
| Lanolini, | āā ℥ss. |

M. Beneficial in urticaria, herpes, and herpes zoster.

| | |
|---|---|
| ℞ Cocainæ hydrochloratis, | |
| Hydrarg. chloridi mitis, | āā gr. x. |
| Zinci carbonatis, | ʒj. |
| Beta-naphthol, | |
| Camphoræ, | āā gr. v. |
| Ungt. zinci oxidi, | ℥j. |

M. Valuable in infantile eczema.

These ointments are serviceable in dermatitis, acute eczema, dermatalgia, herpes zoster, paræsthesia, urticaria, burns, irritable and painful ulcers. Cocaine ointment allays the pain of ulcerated carcinoma and is beneficially applied to painful hæmorrhoids. On account of its astringent and slightly stimulant action, coca ointment is sometimes an efficient application in acne and rosacea. An anodyne ointment may be thus composed:—

| | |
|---|---|
| ℞ Cocainæ hydrochloratis, | gr, x. |
| Morphinæ sulphatis, | gr. ij. |
| Atropinæ sulphatis, | gr. j. |
| Pulveris marantæ, | ʒj. |
| Unguenti zinci oxidi, | ℥j.—M. |

In the treatment of burns cocaine hydrochlorate should be preferably mixed with lanolin, since the latter substance possesses undoubted efficacy in the treatment of this accident.

| | |
|---|---|
| ℞ Cocainæ,. | gr. xv. |
| Lanolini, | ℥iss. |
| Sodii bicarbonatis, | ʒij. |
| Ol. olivæ, | q. s. |

M. et ft. ungt. mollis.

| | |
|---|---|
| ℞ Cocainæ, | gr. x. |
| Lanolini, | ℥j. |
| Bismuthi subnit. vel plumbi carbonatis, | ʒij. |
| Ol. olivæ, | q. s. |

M. et ft. ungt. mollis.

Cocaine is a valuable remedy in pruritus ani or vulvæ and in some cases of eczema. In rhus poisoning and erythema the solution of cocaine promptly relieves the burning pain. Cocaine can be employed in the form of a solution according to the following formulæ:—

| | | |
|---|---|---|
| ℞ Cocainæ hydrochloratis, | | gr. iij. |
| Plumbi acetatis, | | gr. x. |
| Glycerini, | | f℥iss. |
| Aquæ destillatæ, | | f℥ivss. |

M. Sig.: Use as an injection in the urethra in subacute and chronic gonorrhœa.

| | | |
|---|---|---|
| ℞ Cocainæ hydrochloratis, | | gr. ij. |
| Creosoti, | | ♏viij. |
| Glycerini, | | f℥j. |
| Aquæ hamamelidis dest., | | f℥iij. |

M. Sig.: Spray into the nose or throat in simple catarrh, pharyngitis, laryngitis, and in hay fever.

| | | |
|---|---|---|
| ℞ Cocainæ hydrochloratis, | | gr. iv. |
| Plumbi glyceroli, | | |
| Aquæ hamamelidis dest., | āā | f℥ij. |

M. Sig.: Apply over the surface on old muslin, for burning and itching of erysipelas, poisoning of the skin from various plants, and in sunburn and superficial heat burns.

| | | |
|---|---|---|
| ℞ Cocainæ hydrochloratis, | | |
| Hydrastin. hydrochloratis, | āā | gr. iij. |
| Aquæ rosæ, | | f℥iv. |

M. Sig.: Mop upon the skin or apply with old muslin or cotton, for seborrhœa oleosa, urticaria, acne, and rosacea.

Brushing the affected surface with a cocaine solution to which 1 per cent. of carbolic acid has been added is recommended as a useful method in acute tonsillitis.

In gastralgia, the use of cocaine, or of a hot infusion of coca-leaves, is often highly serviceable and yields prompt relief. Cocaine hydrochlorate is an efficient remedy in nausea and vomiting. In the hands of Dr. Manassein it yielded excellent results in the incessant vomiting and collapse of cholera morbus. Prompt relief often follows its use in migraine. In sea-sickness and the vomiting of pregnancy the alkaloid is often useful. In the latter condition it has been used by the mouth, by injection into the epigastrium, or applied in ointment form to the os uteri. Mr. John Phillips afforded permanent relief by administration of the following mixture:—

| | | |
|---|---|---|
| ℞ Cocainæ hydrochloratis, | | gr. $\frac{1}{10}$. |
| Tinct. aurantii, | | ♏x. |
| Mist. chloroformi, | | fʒss. |
| Aquæ, | q. s. ad | fʒj. |

M. pro dosi.

Dr. Carlson has reported a severe case of ptyalism accompanying pregnancy, in which rapid and complete relief was obtained by a few hypodermic injections of cocaine.

As an analgesic mixture which may replace an opiate, Portier recommends:—

| | |
|---|---|
| ℞ Cocain. hydrochlorat., | gr. viiss. |
| Phenacetin., | gr. xxiiss. |
| Exalgin., | gr. viiss. |
| Acid. salicylic. | gr.xv. |

M. et div. in chart. no. x.

Sig.: One powder every three hours until pain has disappeared.

When coca is used as a tonic in cases of debility, slow convalescence after fever, weak digestion, etc., it is usually in the form of an elixir or wine, the alcohol in these cases being synergistic, and possibly in many instances the more active agent in the combination. In these conditions the dangers of the formation of an alcohol habit must be borne in mind, and a change made to the solid extract or an infusion. In laryngeal tuberculosis associated with dysphagia the use of cocaine has been found of marked benefit. In the treatment of secondary syphilis Dr. R. W. Taylor often makes use of coca, especially in the case of debilitated subjects, as a tonic adjuvant to specific medication. He employs the fluid extract and may combine it with the compound tinctures of cinchona and gentian. The weak heart of typhoid fever is supported by ¼-grain doses, every two hours, of cocaine hydrochlorate. According to Thorington, cocaine is of decided efficacy in yellow fever, as it quiets the stomach and stimulates the heart. It is useful in sexual debility.

A decided aphrodisiac effect has sometimes been ascribed to cocaine, but in two cases Dr. Arthur G. Hobbs has observed a contrary influence. In consequence of an application to the throat and nose a rapid and permanent relief of priapism followed after the usual remedies had been employed in vain. The cocaine had, in each instance, been employed on account of coincident nasal and pharyngeal inflammation. Wells has likewise observed the same effect follow applications to the nasal and pharyngeal mucous membranes. This writer has satisfied himself experimentally that cocaine depresses sexual excitability in men. He has likewise observed the same effect follow the internal administration of the remedy.

In various nervous disorders—hiccough, asthma, chorea, paralysis agitans, alcoholic tremors, senile tremor—Bartholow declares that cocaine produces more favorable effects than any other remedy. In asthma Dieulafoy has often afforded relief by the application of a 5-per-cent. solution to the nasal chambers. Dr. J. K. Bauduy, of St. Louis, has found the alkaloid of decided service in melancholia, though in the experience of most neurologists it is of no permanent avail in this affection.

Murrell, of London, recommends the local use in neuralgia of a 20-per-cent. solution of the cocaine hydrochlorate dissolved in oil of cloves. Five to 10 minims of this solution are rubbed in with the finger over the seat of pain. The pain of gouty joints may also be diminished by local application of this remedy.

Several writers have testified to the efficacy of cocaine in small-pox. A solution is given internally in doses proportionate to the age of the patient. Dr. E. Pepper, of Algiers, states that a marked tolerance for the remedy exists in this disease. He states that the evolution of the pustules is arrested and that the course of the fever is shortened.

Waugh has used coca largely in the treatment of alcoholism. For acute cases he employs the following;—

| | |
|---|---|
| ℞ Tinct. capsici, . . . . . . . . . . . . | f ℥j. |
| Vini cocæ, . . . . . . . . . . . . | f ℥vij. |

M. Sig.: A tablespoonful every two to four hours.

To assist in overcoming the habit of alcohol drinking, he gives coca-leaves in the form of a masticatory, which can be easily carried and taken without attracting notice. He believes that the source of the longing for drink is often to be found in the mouth, and that coca when chewed exerts a local anæsthetic effect, as well as a general systemic action. The wine of coca is useful in giving tone to the vocal cords and preventing hoarseness in professional speakers and singers.

Cocaine, or the fluid extract of coca, is an efficient antidote to narcotic poisoning by opiates or chloral, and may be used hypodermically. The subcutaneous injection of cocaine has been found useful in cases of scorpion bite. The treatment rapidly relieves pain and restricts it to the part stung.

**Tropacocaine.**—This is an alkaloid which has been obtained by Giesel from the small-leaved coca plant of Java. Liebermann has determined that in chemical composition it is benzoyl-pseudo-tropein, and regards the pseudo-tropein, which he has succeeded in separating, as identical with the substance of that name derived from hyoscyamus niger. For the sake of convenience the name tropacocaine has been adopted. Liebermann has succeeded in preparing it by synthesis. Although closely related chemically to the solanaceous alkaloids, its physiological and therapeutical properties closely resemble those of cocaine.

**Physiological Action.**—The physiological effects of tropacocaine were first investigated by Dr. Arthur P. Chadbourne, of Boston, who found that in the frog the difference of action between tropacocaine and cocaine is chiefly quantitative. In rabbits repeated small doses caused cerebral stimulation, followed by a quiet interval. After this stage inco-ordination and convulsions ensued. When larger doses were given the convulsive stage was short and was rapidly succeeded by coma, failure of respiration, and death. Small doses at first increase the pulse-rate, but there is in general no considerable temporary rise like that usually produced by cocaine. The increase is followed by decrease of pulse-rate and a gradual but steady fall of blood-pressure. Injection into the jugular vein more or less completely paralyzes the motor ganglia in the heart and quickly lowers the tonus of the peripheral vessels. Tropacocaine produces complete local anæsthesia more rapidly than cocaine, and, as a rule, the effect is more lasting. Tropacocaine has but half the toxicity of cocaine.

A number of experiments were performed by Dr. Hugenschmidt, of Paris, upon human subjects. The injection of 2 centigrammes (about $\frac{1}{3}$ grain) into the gum slightly quickened the action of the heart without affecting arterial tension. There was slight dryness of the throat, but no dilatation of the pupil. The injection of double the quantity caused vertigo and a sudden fall of blood-pressure. The respiration was uninfluenced and the normal pulse-beat was soon regained.

**Therapeutics.**—Tropacocaine was first employed therapeutically in the ophthalmological clinic of Professor Schweigger. Both the physiological and therapeutical investigations were carried on with a synthetically prepared tropacocaine hydrochlorate. The alkaloid derived from the plant causes considerable irritation, but this effect is not produced by the synthetically formed product. Ocular anæsthesia is more rapidly developed than by cocaine, and although of shorter duration, than that due to the latter alkaloid, may easily be maintained by adding a drop of the solution from time to time. It has been used in the form of a 3-per-cent. solution. On account of the rapidity of its action it is particularly adapted for the removal of foreign bodies from the cornea. Tenotomy and iridectomy, also, are satisfactorily performed under its influence. Tropacocaine has been advantageously used in order to prevent pain from caustic applications to the lids, in dividing strictures of the lachrymal duct and opening Meibomian cysts. In dental practice Dr. Hugenschmidt has made use of solutions of tropacocaine and has extracted roots, broken up the alveolus and removed a bony sequestrum without causing the patient any pain. Seifert has reported, concerning the application of tropacocaine to nasal and laryngeal surgery, that stronger solutions are required than are necessary in the case of cocaine. He adds that severe hæmorrhage is apt to follow the employment of tropacocaine.

Tropacocaine possesses antiseptic properties, its solutions keep well and it has the advantage of producing anæsthesia of inflamed tissues. It does not occasion any haze upon the cornea.

## COCCULUS—COCCULUS INDICUS.—Indian Berry, Fish Berry.

### *Preparations.*

*Extractum Cocculi Fluidæ.*—Fluid Extract of Cocculus. *Dose,* ♏i–ij.
*Tinctura Cocculi.*—Tincture of Cocculus (25 per cent.). *Dose,* ♏i–iv.
*Picrotoxinum* (U. S. P.).—Picrotoxin (the active principle). *Dose,* gr. $\frac{1}{120}$–$\frac{1}{60}$.
*Unguentum Picrotoxini.*—Ointment of Picrotoxin (gr, x–℥j of lard).

**Pharmacology.**—Cocculus Indicus is the fruit of Anamirta paniculata (Menispermaceæ), a native of the Malabar coast and of India. In 1812, Boullay discovered and isolated a peculiar bitter principle, which he denominated **Picrotoxin,**—a white, crystallizable, neutral substance, soluble in 150 parts of cold water, or in 25 of boiling, and very soluble in alcohol and ether, but not soluble in oils. Picrotoxin does not form salts. Like digitalin, picrotoxin appears to be made up of several bodies, which vary in their chemical properties and effects. Barth and Kretschy assert that it contains at least three: (1) picrotoxin, a bitter, poisonous principle; (2) picrotin, a bitter, non-poisonous principle; and (3) anamirtin. To these has been added cocculin (which is said to be identical with anamirtin). These pharmaceutical bodies may have scientific interest, but, practically, the prescriber is confined to the picrotoxin of Boullay, which is official in the United States Pharmacopœia. In the pericarp have been found menispermia, paramenispermia, hypo-picrotoxic acid, resin, fat, and gum, which do not possess much medical interest.

**Physiological Action.**—Cocculus, or picrotoxin, is very destructive to lower forms of life, and to many acts as an acrid, narcotic poison. In lower animals, death is preceded by convulsions, and in a fatal case of a child six years old, poisoned by absorption of a strong alcoholic solution of the fruit applied to the scalp, tetanic spasms occurred. Where this agent has been swallowed, the usual treatment, by evacuating the stomach, should be practised, with inhalation of ether or ammonia and the internal administration of chloral or bromides. There is an antagonism between chloral and picrotoxin, and this can be utilized when poisoning has occurred from absorption through the integument.

In an article by William Murrell, of London, on "Picrotoxin and its Properties,"* this able authority states that the peculiar convulsions produced by this agent "differ essentially from the tetanic condition caused by strychnine, and are due to stimulation of the motor centres in the cerebrum, or in the medulla and cord. They assume various forms, the swimming, running backward, and moving round in a circle being the most common. Picrotoxin raises the temperature, stimulates the respiratory centre, and in large doses produces salivation." It acts as an anhydrotic by stimulation of the respiratory centre. "It is allied to **Cicutoxin**—the active principle of the water-hemlock—and to **Coriamyrtin,** derived from **Coriaria myrtifolia.** These drugs stimulate the origins of the inhibitory fibres of the vagus, the vascular and respiratory centres, and the motor areas of the medulla oblongata. In its action on the secretions, picrotoxin is allied to **Pilocarpine** and **Muscarine,** and is antagonized by atropine and other members of that group. The best antidotes to picrotoxin are chloral hydrate and bromide of potassium." On account of its poisonous effects, cocculus has been used from ancient times, made up into a paste and thrown into the water, where the fish are stupefied by it, and are easily captured. Death has occurred in a boy from eating a small quantity (40 grains) of such paste, but it is said that the flesh of the fish so taken is edible. This unsportsmanlike method of fishing in some parts of this country is illegal. On account of its bitterness, cocculus, or "fish berry," is sometimes added to malt liquor to save hops and check fermentation. Possibly this may enter into the solution of the problem of what is the matter with a man when he is drunk, and still further emphasize the importance of regarding intoxication as a condition of poisoning, demanding prompt, intelligent, and skillful treatment.

**Therapy.**—This is an ancient remedy for phtheiriasis, or lousiness, but care should be exercised in the case of children, or where there are abrasions on the scalp, not to use strong solutions, nor to leave them for many minutes in contact with the skin. The hairy scalp, after being thoroughly washed with soap and water, is wet with a solution (f℥ss of the tincture to f℥iv water), or decoction (℥j–Oj), and after a few minutes washed off with an abundance of warm water. Two or three daily applications are sufficient, especially in cases where the hair can be cut short, as in charitable institutions and asylums. It has been claimed that an ointment of picrotoxin is equally efficient with the decoction, but it cannot be regarded as being as safe. For the same reason, cocculus is not advised in the treatment of tinea and other skin affections, although still used for this purpose in India. A small quantity, however, of picrotoxin—not exceeding 1 per cent.—may be usefully prescribed, in combination with ointment of mercuric oleate, for the relief of animal and vegetable parasitic diseases, as scabies, pediculi, trichophytosis, and tinea versicolor.

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* *The Medical Bulletin*, November 1890, p. 402.

In small doses it appears to act as a bitter tonic to the digestive tract, and has therefore been advised in atonic conditions of the stomach and intestinal indigestion attended by torpor of the intestinal walls, and constipation. Flatulence and colic are relieved by the use of picrotoxin. The remedy has likewise been successfully used in painful dyspepsia, vomiting, vertigo and other reflex manifestations dependent upon imperfect digestion. In epilepsy, chorea, alcoholic tremor, paralysis agitans, and functional nervous disorders (migraine, dysmenorrhœa), picrotoxin has been used successfully by Planat and Hammond, Gubler, Phillips, and others. It has been found beneficial in epilepsy, especially when the attacks occur by night or are due to anæmia or onanism.

According to the experience of Dr. D'Amore, picrotoxine is of special benefit in advanced cases of the disease. In a number of cases observed by D'Amore its effect was more permanent than that of atropine. Semmola and Gioffredi have recently reported a case in which picrotoxin succeeded in checking profuse hyperidrosis which developed consecutive to an attack of influenza. There is good evidence in support of the statement made by Murrell as to its value in controlling night-sweating in phthisis in doses of gr. $\frac{1}{60}$, in a pill with sugar and tragacanth (a single dose, at bed-time, or given three times a day). It does not have the disagreeable action upon the throat and skin that atropine has, and frequently succeeds where that fails; but it is slower in producing its anhydrotic effect, requiring several days. Bókai regards picrotoxin as an excellent antidote to opium by reason of the stimulant action of the former substance upon the respiratory and vaso-motor centres.

**COCCUS** (U. S. P.).—**Cochineal.**

**Pharmacology.**—The dried females of Coccus cacti (class, Insecta; order, Hemiptera), when crushed, produce a very brilliant red coloring matter, which consists principally of carminic acid, various salts, tyrosin, urea, fatty matters, etc. The pigment called **Carmine** is the coloring matter precipitated from the decoction by acids, and the salts of tin, or by gelatin; and other colors, such as lake, purple, and lilac, may be obtained by various reagents. It is highly prized in the arts as a coloring agent. As such it is also used in pharmacy, and is an ingredient in the compound tincture of cardamom.

**Physiological Action.**—The physiological reaction of cochineal is not very evident, but it is believed to have antispasmodic and anodyne qualities.

**Therapy.**—Cochineal was used by a preceding generation of physicians for whooping-cough (in gr. ½ doses) and in neuralgia. Its color might lead to its use under the old doctrine of signatures.

**COCHLEARIA.**—**Scurvy-grass.**

**Pharmacology and Therapy.**—Cochlearia officinalis (Cruciferæ), an annual or biennial plant of Northern Europe and United States, contains tannin, a bitter principle, salts and a volatile oil. It is stimulant, diuretic and laxative. Cochlearia is popularly eaten as a salad and is efficacious in scorbutus, chronic rheumatism and chronic malaria. The juice has been used externally for the purpose of stimulating indolent ulcers and, diluted with water, as a mouth-wash for spongy gums and ulcers of the mouth.

### COCILLANA.—Cocillana, Guarea.

*Preparations.*

*Extractum Cocillanæ Fluidum.*—Fluid Extract of Cocillana. *Dose,* ♏x–xx.
*Tinctura Cocillanæ.*—Tincture of Cocillana (25 per cent.). *Dose,* ♏xxx–fʒij.

**Pharmacology.**—The Cocillana of Bolivia, a Guarea of undetermined species, is a large tree belonging to the Meliaceæ. The name Sycocarpus Rusbyii, bestowed upon the tree by Professor Britton, has been generally accepted. The bark is used as an expectorant, having an influence upon the respiratory organs similar to ipecac, but "superior to it in certain diseases of the air-passages, in which the latter is often used" (D. D. Stewart).[*] It also has a tonic effect upon the digestive organs, and gives promise of usefulness as a laxative. It was discovered and brought to this country by the eminent botanist, Dr. H. H. Rusby, who also introduced pichi, another valuable South American remedy. The constituents of the bark have not been determined, but it is probable that it owes its effects to an active principle, resinous in character, soluble in chloroform (Schrenk), or perhaps an alkaloid (Rusby). The odor of the resinous principle is peculiar and characteristic; its taste is bitter, mawkish and slightly astringent.

**Physiological Action and Therapy.**—In native medicine, cocillana is used as an emetic and cathartic. A free discharge of mucus, nausea and gagging, with some tendency to perspiration, also dizziness and lassitude, were caused in one case where 20 grains were given. Larger doses (gr. xxx–l) caused vomiting at the end of an hour, evacuations of the bowels, sneezing, and prostration, the effects resembling those of emetine. The active principle is excreted chiefly by the mucous membrane of the respiratory tract, upon which it acts as a stimulant.

Small doses improve the appetite and digestion. The alvine discharges under its use contain mucus and bile. This drug stimulates the sudoriparous glands. When given in considerable quantities it causes copious perspiration, accompanied by prostration of muscular strength. Excessive quantities excite severe gastro-intestinal irritation and have, in some reported cases, caused death.

This drug finds its special usefulness in bronchitis, particularly the subacute and chronic forms. The fluid extract is preferable to the tincture in acute bronchial attacks. Cocillana is an effective remedy in coryza, spasmodic croup, persistent hoarseness and cough after measles, the cough of influenza, asthma, hay fever, and in the declining stage of pneumonia. It relieves the cough of pulmonary tuberculosis.[†] Small doses of cocillana have likewise been used with success in atonic dyspepsia. The fluid extract diluted with water and used as a spray has been recommended as a useful application in acute and chronic coryza.

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[*] *Medical News*, August 24, 1889.

[*] See paper by author on "The Therapeutical Applications of Cocillana" in *Medical Bulletin*, February, 1893.

**CODEINA** (U. S. P.).—**Codeine.**

**Dose,** gr. ¼–ij.

An alkaloid prepared from opium. Codeine does not disorder the stomach or bowels and does not give rise to sweating or eruptions upon the skin. It is more antispasmodic than morphine and has less narcotic effect.* It is used preferably in the treatment of cough, cramps in the stomach or bowels, and in neuralgia and painful affections of the genito-urinary organs. In diabetes it checks the formation of sugar, and in some cases permanently arrests it. In these cases it is borne well in larger amounts, as much as 10 to 15 grains daily having been taken with benefit. Fraser claims, however, that equally good effects may be obtained in smaller doses from morphine hydrochlorate, which is also very much cheaper.

Codeine is also employed in diabetes insipidus and has been found of service in enteralgia and other painful affections of the bowels. It is claimed that codeine may be advantageously employed in the treatment of the opium or morphine habit. Dr. Perininger finds codeine of value in pulmonary tuberculosis with insufficient expectoration, troublesome cough and chest-pains. In bronchitis it also proved of service, caused no disorder of the stomach and even seemed to benefit some cases of dyspepsia. In pertussis its use was attended with good results.

**COFFEA.—Coffee.**

*Preparation.*

*Extractum Coffeæ Viridis Fluidum.*—Fluid Extract of Green Coffee. *Dose,* f℥ss–ij.

**Pharmacology.**—The seeds or berries of Coffea Arabica (Rubiaceæ) are only officially recognized as one of the sources of caffeine. Before roasting, coffee contains **Caffeine** and caffeo-tannic acid. Dr. Palladine has isolated a new alkaloid which he terms caffearine, and which occurs in the form of crystalline needles, soluble in water and alcohol. Caffeine hydrochlorate is very soluble in water but does not dissolve in absolute alcohol. During roasting a volatile oil is developed and several substances formed, which give to coffee its aroma and flavor, these empyreumatic substances being known collectively as **Caffeone.** It is suggested, therefore, that the use of coffee may prove of some prophylactic value during epidemics of those infectious diseases which are commonly transmitted through the medium of drinking water. Strong infusions of coffee, as Luderitz has shown, are destructive to the organisms of typhoid fever, erysipelas and cholera.

**Physiological Action.**—Coffee differs from caffeine in being more stimulating to the intestinal tract, especially increasing the peristaltic movements, which are not affected by caffeine. Taken in the morning, before rising, coffee will often produce a laxative effect. It produces a general feeling of warmth and well-being, dilates the superficial blood-vessels, and lowers arterial pressure. It also stimulates the nervous system, in some persons causing exhilarating effects upon the cerebrum and increasing capacity for intellectual labor, and frequently is the cause of headaches in persons who take it habitually or in excess. A case has lately been reported* in which about 2½ ounces of the ground berries were made into a strong infusion and swallowed by a vigorous man. Two and a half hours later he was attacked by dizziness, severe cardiac pains, palpitation, nausea, vomiting, and generalized tremors. The tremors persisted for twelve hours after all other symptoms had disappeared.

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* Codeine, by Dr. Loewenmeyer, *Deut. Med. Woch.*, *Weekly Medical Review*, November 29, 1890.

The habitual use of coffee has been known to cause pruritus ani. Overindulgence in its use is also apt to occasion inactivity of the liver and the manifestations known as "biliousness."

**Therapy.**—It is valuable as a stimulant in cases of narcotic poisoning, especially by opium. In some cases it produces fullness of the portal circulation, interfering with the activity of the hepatic functions and causing hæmorrhoids. Its laxative effects are useful in persons leading sedentary lives, in preventing constipation. It has some astringent and antiseptic qualities, and is believed to have some effect in preventing malaria. According to the observation of Dr. Alice McLean, the use of coffee by nursing women diminishes the secretion of milk. The fluid extract of the unroasted coffee contains caffeine, but no caffeone. It is used in anæmic headache, and in cases of low fever as a cardiac stimulant where collapse is threatened. A solution of green coffee, prepared by macerating 6½ drachms over night, has been employed by Landarrabilco in nephritic colic and migraine.

### **COLCHICI RADIX** (U. S. P.).—**Colchicum-Root, Meadow-Saffron.**

### **COLCHICI SEMEN** (U. S. P.).—**Colchicum-Seed.**

*Preparations from the Root.*

*Extractum Colchici Radicis* (U. S. P.).—Extract of Colchicum-Root. *Dose,* gr. ss–ij.

*Extractum Colchici Radicis Fluidum* (U. S. P.).—Fluid Extract of Colchicum-Root. *Dose,* ♏ii–iv.

*Vinum Colchici Radicis* (U. S. P.).—Wine of Colchicum Root (40 per cent.). *Dose,* ♏v–fʒss.

*Preparations from the Seed.*

*Extractum Colchici Seminis Fluidum* (U. S. P.).—Fluid Extract of Colchicum-Seed. *Dose,* ♏ii–v.

*Tinctura Colchici Seminis* (U. S. P.).—Tincture of Colchicum-Seed (15 per cent.). *Dose,* ♏v–fʒj.

*Vinum Colchici Seminis* (U. S. P.)—Wine of Colchicum-Seed (15 per cent.). *Dose,* ♏x–fʒj.

*Colchicina.*—Colchicine (the active principle). *Dose,* gr. $\frac{1}{100}$–$\frac{1}{60}$.

Colchicum-root is the whole, or sliced, and dried corm of Colchicum autumnale (Liliaceæ), or meadow-saffron, a native of the temperate parts of both Europe and Northern Africa, of which the seed is also official. It contains **Colchicine** (rather more in the seeds than in the root); and traces of **Veratrine** in combination with gallic acid and a fixed oil are found. The value of colchicum is tested by its bitterness, due to the presence of colchicine, an alkaloid, appearing in small crystals (Geiger and Hesse); is soluble in water and alcohol, but changed by most acids into **Colchiceine,** a neutral substance and a resin, both isomeric with colchicine. Wine and vinegar extract the medical principles from the drug, and the official extract is made with the aid of acetic acid. Probably each of them contains a small amount also of colchiceine. In ordering the wine, it is necessary to designate which preparation is required, as the wine of the seeds differs in effects from that of the root, on account of the difference in content of colchicine, which is not entirely equalized by the pharmacopœial expedient of altering the proportion of crude drug in each. The fresh seed contains a small portion of volatile but very active oil, and the best preparation would be a tincture made from the fresh seeds in alcohol; but colchicine, when administered in granules, pill, or by hypodermic injection, is said to secure the full therapeutic effect.

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* *Therapeutische Monatshefte*, March, 1890.

**Physiological Action.**—When applied to the skin, colchicum acts as an irritant, causing hyperæmia and smarting, and the dust inhaled causes sneezing and conjunctival injection. In small doses it occasions an acrid taste in the mouth, increased secretions from the salivary glands due to reflex action, and gastro-intestinal disturbance, which increases with the quantity taken. The pulse-rate is decidedly reduced, and in some cases a diaphoretic effect is observed. A single large dose or small ones long continued cause violent vomiting and purging (first serous, then mucous, then bloody), or acute gastro-intestinal irritation. Marked symptoms of collapse supervene: the pulse becomes small, rapid, and thready; the skin cold and bedewed with sweat; respiration slow and painful. Death ensues from collapse, the brain remaining clear to the last. Sometimes nervous symptoms, flying pains, and numbness may appear, and occasionally, though rarely, convulsions (Brunton). Pains in the joints and urinary passages also may be produced by colchicum.

In some instances the action of the kidneys is but slightly affected, in other cases it is increased, and again it may be diminished or suppressed. In fatal cases of colchicum poisoning the blood has been found of a dark color and impaired coagulability. The intestinal mucous membrane is highly inflamed, and this effect is equally produced even when the alkaloid has been given by the hypodermic method. A very large dose does not cause a more marked effect than a moderately large one. The action upon the alimentary canal is the same, whether the drug be swallowed or hypodermically injected. When, during the administration of colchicum, there appear irritation of the fauces, loaded tongue, loss of appetite, flatulence, uneasiness, or pain in the stomach and diarrhœa, the drug is beginning to exercise toxic effects, and should be discontinued or suspended for a time. Colchicum has a selective action upon the sensory nerves and spinal cord, which are more or less paralyzed; the brain, motor nerves, and muscles are not affected. The inhibitory fibres of the vagus are paralyzed only by very large doses. The discharge of bile and of urine is largely increased; Rutherford claims that it is a true cholagogue, and Christison and others assert that it is diuretic, increasing the quantity of salts as well as the water, both of which have been denied by Gubler, who simply regards it as cathartic, only exercising good effects when three or four discharges from the bowels are obtained daily through its action. When symptoms of poisoning make their appearance, the patient should be kept in a recumbent posture, encouraged to vomit, and allowed to drink freely of infusion of tea or coffee, on account of the tannin they contain as well as their action as arterial stimulants. Morphine and atropine may be administered hypodermically in small doses. The administration of oil is of service on account of its emollient effect upon the mucous membrane. If collapse occurs heat and cardiac stimulants are required. If there is much distress, sinapisms should be applied to the abdomen and the patient kept warm. Poisoning may occur in refilling prescriptions, as the preparations vary greatly in their activity; some samples of fluid extract contain very little, if any, of colchicine, while others are of standard strength. Fatal cases have been reported from taking $2\frac{1}{2}$ or $3\frac{1}{2}$ drachms of the wine of colchicum root. Dangerous symptoms have been caused by doses of $\frac{1}{6}$ grain or $\frac{1}{3}$ grain of colchicine, and $\frac{1}{2}$ grain of the alkaloid has caused death.

**Therapy.**—Colchicum may be used in small doses as an ingredient in cholagogue pills, but its chief use is in the treatment of attacks of gout and in the relief of symptoms more or less directly attributable to gout, as dyspepsia, bronchitis, asthma, etc. In rheumatic arthritis or rheumatic gout, we may give:—

| | |
|---|---|
| ℞ Tincturæ colchici, | ♏x. |
| Potassii iodidi, | gr. x. |
| Syr. sarsaparillæ comp., | fʒ iss. |
| Aquæ destillatæ, | fʒ ss. |

M pro dosi. Take every three or four hours, will diluted.

| | |
|---|---|
| ℞ Vini colchici seminis, | fʒ iv. |
| Sodii salicylatis, | ʒ iij. |
| Sodii iodidi, | ʒ j. |
| Spiritus chloroformi, | fʒ iij. |
| Inf. buchu, | ad f℥ viij. |

M. Sig.: A teaspoonful every three or four hours.

Scudamore's gout mixture is also very good:—

| | |
|---|---|
| ℞ Magnesii sulph., | ℥ ij. |
| Magnesii carbonatis, | ʒ ij. |
| Vini colchici seminis, | fʒ vj. |
| Aquæ menth. pip., | ad f℥ xij. |

M. Sig.: A tablespoonful every four hours.

Colchicum is generally given in acute attacks of gout, in combination with an alkali:—

| | |
|---|---|
| ℞ Magnesii sulphat., | ℥ ss. |
| Magnesiæ, | ʒ ij. |
| Tinct. colchici, | fʒ ij. |
| Syrupi zingiberis, | f℥ j. |
| Aquæ menthæ pip., | f℥ v. |

M. Sig.: Take a tablespoonful every two hours, until the bowels are freely moved from four to six times in twenty-four hours,

Or the extract of the root may be given (gr. i–ij) several times daily, or the wine of the seeds in $\frac{1}{2}$-drachm doses.

| | |
|---|---|
| ℞ Colchicinæ, | gr. ss. |
| Codeinæ, | gr. x. |
| Quininæ hydrobromatis, | ʒ j. |

M. et ft. pil. no. xl.
Sig.: Take one every two hours for gouty neuralgia.

The wine of the seeds is, perhaps, the preparation most frequently prescribed, and in an acute paroxysm of gout is best given in a moderately large dose ($\frac{1}{2}$–1 drachm). Within a few hours the pain is allayed, the heat and swelling begin to subside. In order to secure relief it is not necessary that the drug should manifest its diuretic or purgative effects. In chronic gout small doses (♏xv–xx) three or four times a day are appropriate. Though colchicum exerts an action which may be termed specific, it is nevertheless but palliative, since attacks recur. Of little or no value in acute rheumatism, colchicum is sometimes of service in the chronic form of the disease. Neuralgia dependent upon a gouty or rheumatic condition is often effectually treated by means of colchicum, a drachm of the wine being given at bed-time, together with a dose of morphine sulphate. The same preparation is not infrequently serviceable in gonorrhœa, and 30 minims at bed-time is an old treatment for chordee.

Ch. Abadie has found very minute doses of colchicine (0.001 gramme $=\frac{15}{1000}$ grain) two to four times a day to be of great value in scleritis, whether due to gout or rheumatism.

F. Woodbury recommends its hypodermic injection in sciatica, into the sheath of the nerves, and in muscular rheumatism.* A combination of colchicine with the natural salicylate of methyl is of value in subacute and chronic rheumatism. In gouty neuritis Dr. C. D. F. Phillips has found the following combination beneficial:—

| | |
|---|---|
| ℞ Colchicin., . . . . . . . . . | gr. $\frac{1}{60}$. |
| Quinin. sulphat., . . . . . . . . | gr. j. |
| Extr. colocynthidis, . . . . . . . | gr. j. |

M. ft. pil. no. j. Mitte tales no. xx.
Sig.: One pill three times a day.

Colchicum has also given good results in the treatment of ascites, gonorrhœa and chordee.

## COLLINSONIA CANADENSIS.†

### *Preparations.*

*Cortex Collinsoniæ.*—Powdered root. *Dose*, gr. x–lx.
*Infusum Collinsoniæ.*—Infusion of Collinsonia. *Dose*, f℥i–iv.
*Extractum Collinsoniæ Fluidum.*—Fluid Extract of Collinsonia. *Dose*, ♏–fʒj.
*Tinctura Collinsoniæ.*—Tinctura of Collinsonia. *Dose*, ♏xx–fʒij.

**Pharmacology.**—This indigenous plant, belonging to the natural order Labiatæ, and popularly known as stone-root, or knob-root, grows from April to October in richly-wooded soils throughout the United States. All parts of the plant may be used, but its virtues reside chiefly in the root, and depend principally upon the presence of a volatile oil. It possesses a rank, aromatic odor, and a warm, somewhat pungent taste.

**Physiological Action.**—Collinsonia is a local astringent. It exerts a sedative effect upon mucous membranes, and produces a sensation of warmth in the stomach and bowels. Large doses give rise to diaphoresis, nausea, and, perhaps, vomiting.

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* *Phila. Medical Times*, vol. xiii, p. 154.

† See paper by author, in Transactions of the Ninth International Medical Congress, vol. iii, p. 76. Washington, D. C., U. S. A.

**Therapy.**—Collinsonia is a good local application to incised or contused wounds. A drachm of the powdered root to an ounce of lard constitutes a stimulant application to indolent ulcers. The fluid extract, diluted with 4 parts of water and used as a rectal injection, effectually destroys ascarides.

This remedy, given internally, acts as an astringent tonic, antispasmodic and sedative. It increases the appetite, promotes digestion and elimination, and is therefore useful in anæmia, chlorosis, the early stage of phthisis, and in convalescence from the eruptive fevers. Relaxed uvula, chronic pharyngitis, and hoarseness due to impaired tonicity of the vocal cords are benefited by the local action of collinsonia. A cup of hot infusion at bed-time will abort an ordinary cold, or mild lumbago. The fluid extract is very beneficial to gastro-intestinal catarrh, whether dependent upon alcoholism or other cause. The remedy is especially useful in the former case, since it seems to lessen the desire for liquor.

Various spasmodic affections are relieved by collinsonia. The hot infusion is a useful remedy in spasmodic croup. In whooping-cough the paroxysms are ameliorated, and it is valuable in nervous cough and the irritative cough of pharyngitis. It is sometimes of service in chorea. Spasmodic contraction of the sphincter ani not uncommonly gives rise to constipation, hæmorrhoids, neuralgia of the rectum, with vague pelvic and abdominal symptoms. This spasm and the train of disorders dependent upon it may often be relieved by the employment every night of a suppository containing from 10 to 60 grains of powdered collinsonia-root. Some cases of dysmenorrhœa are markedly benefited by the administration of the fluid extract for a week preceding and during the period. It is probable that vaginal suppositories containing this remedy would be of service in vaginismus. Excellent results are obtained from collinsonia in renal and biliary colic. Spasm of the ducts is relaxed, and the irritation of the mucous membranes soothed. The increased flow of urine induced facilitates the expulsion of small calculi. Infantile colic and flatulent colic in adults are also amenable to the influence of this drug. In combination with aconite and morphine it is more rapidly efficacious than any other treatment of acute cystitis, and should be tried in chronic cystitis.

Dr. Chevers recommends the following mixture in the treatment of chronic cystitis :—

| | | |
|---|---|---|
| ℞ | Tr. collinsoniæ, . . . . . . . . . . | fʒvj. |
| | Copaibæ, . . . . . . . . . . . . | f℥iij. |
| | Liq. morphin. sulph., . . . . . . . . | fʒss. |
| | Liq. potass., . . . . . . . . . . . | f℥ss. |
| | Ol. menth. pip., . . . . . . . . . . | ♏iij. |
| | Aq. camphor., . . . . . . . . q. s. ad | f℥vj. |

M. Sig.: A tablespoonful every four hours.

Incontinence of urine in children and the dripping of a few drops of urine after the act of micturition is apparently completed, due to hyperæsthesia of the prostatic urethra or neck of the bladder, may be effectually relieved by the fluid extract. The writer has seen it arrest the discharge of chronic gonorrhœa after the customary blenorrhetics had been exhibited in vain. It has likewise been found very beneficial in leucorrhœa and prostatorrhœa.

## **COLLODIUM** (U. S. P.).—**Collodion.**

*Preparations.*

*Collodium Cantharidatum* (U. S. P.).—Cantharidal Collodion. External use.
*Collodium Flexile* (U. S. P.)—Flexible Colodion. External use.
*Collodium Stypticum* (U. S. P.).—Styptic Collodion. External use.

**Pharmacology.**—Collodion is pyroxylin, or gun-cotton (3 parts) dissolved in ether (75 parts) and alcohol (25 parts). Blistering collodion has cantharides (60 parts), exhausted by chloroform and evaporated (to 15 parts), to which is then added flexible collodion (85 parts). Collodion flexile is collodion (92 parts), to which Canada turpentine (5 parts) and castor-oil (3 parts) have been added. Styptic collodion contains tannic acid (20 parts) dissolved in alcohol (5 parts), ether (25 parts), and collodion (a sufficient quantity). Collodion is a clear, syrupy fluid, smelling strongly of ether; and should be kept in a glass-stoppered bottle, tightly corked, remote from lights and fire. When painted upon a surface, the ether quickly evaporates, leaving a film of pyroxylin, which is adhesive and tends to contract or pucker up.

**Therapy.**—Collodion is used to cover excoriated surfaces and to seal small wounds. Larger wounds may be drawn together and kept in position by strips of gauze, the ends of which are made to adhere to the skin by several coats of collodion painted on with a camel's-hair pencil. Sometimes it gives rise to pain, irritation, and even blistering when a comparatively large area is thus covered. The contraction caused by the drying of collodion is made use of in the treatment of the early stages of boils and styes, and the papules in small-pox, to prevent pitting. Where several coats are to be applied, the flexible collodion is preferable. It has also been used in herpes zoster and erysipelas, and the compression exerted by it has been utilized in the treatment of epididymitis, painting freely over the testicle and cord. A coating of collodion is likewise beneficial in the erythematous variety of burns. This substance is an exceedingly useful application to scalp-wounds, in which, besides approximating the edges and excluding the air, it does away with the necessity for a bandage. The pressure produced by the contraction of collodion has been successfully utilized in the treatment of umbilical hernia, varicocele, and spina bifida.

Several cases have been reported by the French physicians in which the repeated application of collodion to the entire surface of the abdomen in tuberculous peritonitis was followed by recovery. In the nocturnal incontinence of urine in children it is often advantageous to seal the orifice of the urethra or the end of the prepuce with collodion. This method will not infrequently break up the habit within a few weeks. The styptic collodion may be used on cracked nipples, or for small wounds where an astringent may be desired. Extract of cannabis Indica (2 parts), with salicylic acid (11 parts) in flexible collodion (87 parts), is a deservedly popular remedy for soft corns, under the name of the green solution for corns (collodium salicylatum compositum, N. F.). Iodine and iodoform have been used, dissolved in collodion, as an application to gouty or rheumatic joints, but the former sometimes exerts an unexpectedly caustic action, and has been followed by sloughing.

Numerous collodion preparations have been suggested and employed for various purposes. Among these may be mentioned a 10-per-cent. chrysarobin collodion; a cocaine styptic collodion, containing 5 per cent. of cocaine hydrochlorate, 15 per cent. of tannic acid and 30 per cent. of alcohol; diachylon, 10 per cent. each of lead plaster and alcohol with 20 per cent. of ether; a collodion for freckles, containing 2 per cent. of sulphophenyl zinc; collodions in which oleate of mercury, zinc or other oleates are incorporated; a 10-per-cent. salol collodion for chapped hands, etc.

**Crystalline.**—A solution of pyroxylin in methylic alcohol has been introduced under the name of crystalline. The preparation is similar to collodion, but the solvent evaporates more slowly and the resultant pellicle is perfectly translucent. An elastic crystalline, corresponding to elastic collodion, has been made by Dr. Phillips according to the following formula.—

| | |
|---|---|
| ℞ Crystallin., | ʒ v. |
| Ol. ricini, | f ʒ i¼. |
| Terebinth. canadensis, | ʒ ijss. |
| M. | |

An excellent white varnish is made by mixing:—

| | |
|---|---|
| ℞ Crystallin., | ℥ j. |
| Ol. ricini, | f ʒ j. |
| Zinc. oxid., | ʒ ij. |
| M. | |

Pyrogallic acid, salicylic acid, chrysarobin, corrosive sublimate and many other medicinal substances are readily soluble in crystalline, which may, therefore, be used with advantage as a vehicle for various substances in the treatment of tinea tonsurans, warts, eczema, acne, lupus erythematosus, etc.

## COLOCYNTHIS (U. S. P.).—Colocynth, Bitter Cucumber.

**Dose**, gr. ii–v.

### *Preparations.*

*Extractum Colocynthidis* (U. S. P.). Extract of Colocynth. *Dose*, gr. ii–iij.

*Extractum Colocynthidis Compositum* (U. S. P.). Compound Extract of Colocynth. *Dose*, gr. iv–x.

The compound extract of colocynth should be kept in tightly closed bottles. It is an ingredient in compound cathartic pill (comp. ext. of colocynth, extract of jalap, calomel, gamboge. *Dose*, i-iij).

**Pharmacology.**—The fruit of Citrullus colocynthis deprived of its rind, a native of Western Asia, but cultivated in various portions of the world (Cucurbitaceæ). The pulp of the fruit after separation of the seeds, which are inert, contains a yellow, either amorphous or crystalline, bitter, alkaloidal principle, **Colocynthine**, soluble in water and in alcohol; also a resin, **Colocynthein**, and **Colocynthitin**, the latter insoluble in water and not possessed of purgative effects, a tasteless crystalline body.

**Physiological Action.**—In small doses colocynth acts as a simple bitter, increasing the secretions and improving appetite. In larger doses it augments the flow of bile and acts powerfully as a drastic and hydragogue cathartic. Overdoses cause gastro-intestinal irritation, griping and purging. It is generally combined with other drugs to avoid this unpleasant action. Colocynth has some diuretic properties and indirectly acts as an emmenagogue. In excessive doses colocynth has caused death. Less than a drachm has been known to produce a fatal result, though recovery has occurred in other cases after a considerably larger quantity.

**Therapy.**—Colocynth is a valuable purgative in chronic constipation or torpidity of the bowels. It produces soft, pulpy stools by stimulating peristalsis. Its griping tendency may be overcome by combining it with aromatics or a small proportion of hyoscyamus or belladonna :—

| | | |
|---|---|---|
| ℞ | Extracti colocynth. comp., | ʒj. |
| | Ext. belladonnæ alc., | gr. ij. |
| | Saponis, | gr. x. |
| | Ol. cajuputi, | ♏v. |

M. et ft. pil. no. xx.
Sig. : Take one or two at night for habitual constipation.

In chronic dropsy of serous cavities, or cerebral congestion, the compound extract may be given with compound liquorice-powder. The compound cathartic pills are excellent for cases of *embarras gastrique*, or so-called biliousness. In chlorosis, colocynth is useful with iron. A principle known as citrullin, extracted from colocynth, exercises a stimulant effect upon the abdominal organs and especially upon the intestinal glands. It also acts upon the abdominal and pelvic vessels and nerves and quickens peristaltic movements. Given in the form of a suppository, citrullin is successful in relieving persistent constipation and, according to G. Archie Stockwell, is of value in hernia when strangulation is threatened. In solution citrullin has also been used as an enema, and Kohlstock reports from the clinic of Professor Senator, of Berlin, that it yielded excellent results. Colocynthin has likewise proved of service, used in the same manner. These substances produce no local irritant effect nor occasion any tendency to constipation. Small doses of colocynth are said to be useful in sciatica, ovaralgia and other forms of neuralgia.

## CONDURANGO.—Condurango.

**Pharmacology.**—Of the several plants known in New Grenada under the name of condurango, the Condurango blanco is that which has the greatest medical interest from the remarkable claims that have been made for it. It is a vine stated to belong to a new genus of Asclepiadaceæ, and the name Pseusmagenuetus equatorium has been proposed for it.* The bark is separated from the stem by beating with a wooden mallet, and afterward dried in the sun. It is from $\frac{1}{10}$ to $\frac{1}{6}$ inch in thickness; its external surface is smooth and of an ashy-gray color. It contains a yellow resin, extractive, tannin, etc. The root contains 2 per cent. of glucoside, named condurangin, which causes well-marked toxic symptoms when subcutaneously injected, but is harmless when taken into the stomach. Condurangin is decomposed by the digestive fluids into new and innocuous compounds.

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* United States Dispensatory, Wood, Remington, and Sadtler, p. 1628.

Condurangin may be separated into two parts, one of which is soluble and the other insoluble in water. According to Kobert, condurangin is a mixture of at least two glucosides, and Carrara claims to have isolated another glucoside differing from condurangin in solubility. Flückiger has found a small quantity of an alkaloid in condurango bark.

**Physiological Action.**—To the resin the effect of the bark is ascribed, as it yields its virtues to alcohol. In the form of a decoction representing 2 or 3 drachms, however, it produces decided therapeutic effect. It has caused diaphoresis, increased secretion of urine, and even vertigo and disturbance of vision, with increased activity of the circulation. Brunton failed to find any therapeutic value in a specimen examined by him.

**Therapy.**—About a score of years ago condurango was brought to the notice of the profession as a specific for cancer, and especially gastric cancer, and reports were published of its wonderful cures in its native habitat. Having failed to fulfill the extravagant claims that were made in its favor, and no other use being then proposed for it, condurango was allowed to retire into obscurity along with its introducers. About four or five years ago, however, some prominent German clinicians—Ruhle, Binz, Immermann, and Riess—again directed attention to it, claiming that it was a good stomachic tonic; and in a large number of cases presenting symptoms of cancer of the stomach, in which the drug was used, the result was favorable. The remedy was not without success in a single one out of over a hundred cases. This remedy seems to allay the digestive disturbance and pain which accompany organic disease of the stomach. Riess administered a decoction (5 per cent.), of which 6 ounces are given every day, with syrup of orange-peel. Kobert, however, asserts that the decoction must be a bad form of administration, since boiling water destroys the glucosides upon which the virtue of the bark depends.

Immermann advises the use of a wine of condurango as a good preparation. The tincture is a valuable remedy in gastric catarrh.

### **CONIUM** (U. S. P.).—**Hemlock.**

#### *Preparations.*

*Extractum Conii Fluidum* (U. S. P.).—Fluid Extract of Conium. *Dose*, ♏i–v.
*Extractum Conii* (U. S. P.).—Extract of Conium. *Dose*, gr. ss–ij.
*Tinctura Conii.*—Tincture of Conium (15 per cent.). *Dose*, ♏x–xxx.
*Coniina.*—Coniine (the active principle). *Dose*, ♏$\frac{1}{10}$–j.
*Coniinæ Hydrobromas.*—Coniine Hydrobromate. *Dose*, gr. $\frac{1}{12}$–j.
*Succus Conii.*—Conium-juice expressed from fresh leaves and alcohol added ($\frac{1}{3}$ of the volume) to preserve it. *Dose*, fʒss–ij.

**Pharmacology.**—The full-grown fruit of Conium maculatum (Umbelliferæ) gathered while yet green is official as hemlock; although the leaves are still used, they are less active, the seeds being about three times as strong, A tincture of the leaves (12½ per cent.) was formerly official (dose, fʒss–j), but, like conium juice, it is unreliable in strength, and should be abandoned in favor of preparations from the seeds. The habitat of hemlock is Europe and North America. It contains three alkaloids and both volatile and fixed oils. The most important alkaloid is **Coniine**, a colorless, oily liquid, alkaline in reaction, with an acrid, tobacco-like taste and a characteristic odor resembling the urine of rats. Coniine is soluble in alcohol; only very slightly so in water. It is very volatile, and easily decomposed by light or heat. It is most abundant in the nearly-ripe fruit of the plant in its second year. **Methyl-coniine**, another alkaloid, is associated with the preceding, and also **Conhydrine**, a crystallizable alkaloid, convertible into coniine by abstraction of the elements of one molecule of water.

A fourth alkaloid has been isolated by Merck. It is believed to be of similar composition to conhydrine and has, therefore, been termed pseudo-conhydrine. It forms easily soluble salts. Their medicinal effects are less evident than those of coniine.

**Physiological Action.**—The local effects are sedative in painful conditions. No influence upon secretion has been noticed. Gastric disturbance results from a full dose of conium; nausea and vomiting appear early. Following this, there are staggering gait, weakness of the limbs, numbness, fatigue, ptosis, double vision, pupils slightly dilated, vertigo, lowered respiration, and labored speech. In poisonous doses there are loss of power of muscles, commencing in the lower extremities; loss of sight and of speech, and, finally, death from paralysis of respiration. The function of the sensory nerves is likewise impaired by excessive doses. No characteristic lesions are found after death from conium.

The heart's movements seem to be unaffected and the mind remains clear until the brain is overcome by accumulation of carbonic-acid gas in the blood. In a case of poisoning, the stomach should be emptied and coffee promptly given, with hypodermic injections of atropine. Muscular exercise delays the action of the poison. Free counter-irritation by mustard would doubtless be serviceable. The physiological antagonists are strychnine, physostigmine, and atropine; tannic acid is incompatible. Upon the nervous system methyl-coniine acts slightly differently from coniine; the latter paralyzes the motor nerves from the extremities, gradually extending up to the motor centres; the former affects first the motor columns of the spinal cord. The sensory nerves and muscular irritability remain unaffected. The excretion from the system of coniine is chiefly by the breath and the urine. The use of conium is sometimes followed by an erythematous or papular eruption.

**Therapy.**— Poultices of the leaves of hemlock and flaxseed (2 of the the former to 6 of the latter), with boiling water, have been used as a soothing dressing to painful swellings; they should be applied with caution where there are abrasions or ulcers. Conium possesses both anodyne and anti-spasmodic virtues, and has long been reputed to exercise a deobstruent influence upon glandular and other enlargements. A hemlock ointment, made by bruising the leaves with sufficient water, extracting and incorporating the juice with lard or other excipient, is an efficacious local remedy in painful maladies. It assuages the pain of cancer and may be beneficially spread upon irritable or painful ulcers and painful hæmorrhoids. It likewise affords relief when applied over the seat of pain in neuralgia, herpes zoster, chronic rheumatism, gout, or synovitis. The ointment is appropriately used in order to reduce the volume of enlarged scrofulous glands, enlarged mammary glands, liver, or spleen, and goitre. It may be spread upon the breast when the secretion of milk is excessive or requires suppression. In whooping-cough and asthma,, hemlock ointment may be applied to the chest to assist the action of other remedies. Conium may be prescribed in form of ointment as follows:—

| | |
|---|---|
| ℞ Extracti conii alc. | ʒj. |
| Cocainæ hydrochloratis, | gr. v. |
| Atropinæ sulphatis, | gr. j. |
| Veratrinæ, | gr. xx. |
| Ungt. aquæ rosæ, | ℥j. |

M. For neuralgia, chronic rheumatism, gout, and synovitis.

| | |
|---|---|
| ℞ Extracti conii alc., | ʒj. |
| Mentholi, | gr. v. |
| Extracti belladonnæ alc., | gr. x. |
| Ungt. zinci oxidi, | |
| Lanolin., | āā ℥ss. |

M. For painful cancer, scrofulous glands, herpes zoster, and enlarged mammary glands.

The vapor of coniine, or the fluid extract with hot water in an inhaler, yields good results in catarrh, laryngitis, irritative cough, and acute bronchitis, or the persistent cough of phthisis. The local hypodermic injection of coniine has been employed in order to quiet the intercostal muscles in pleurisy and pneumonia; but the hydrobromate, being more permanent, is a better preparation. Other painful and spasmodic diseases have been benefited by the same method. Among these may be instanced angina pectoris, emphysema, asthma, acute mania, and tetanus. Dr. Harley warmly advocates the use of conium in chorea; also in nervous twitchings, blepharospasm, and post-hemiplegic tremor. In various spasmodic affections of children, convulsions, spasm of the larynx, trismus, spasmodic wryneck, and whooping-cough, it has also been much approved. In ovaritis and in dysmenorrhœa, its administration in the following prescription is frequently followed with great relief from the pain:—

| | |
|---|---|
| ℞ Succi conii, | fʒvj. |
| Potassii bromidi, | ʒiij. |
| Spiritus chloroformi, | fʒij. |
| Aquæ camphoræ, | ad f℥viij. |

M. Sig.: From a half to a tablespoonful every two or three hours.

Conium has been highly recommended in paralysis agitans and hysteria. In acute mania, mania a potu, and active delirium tremens, it quiets motor excitement, finding, as it does, its principal usefulness in diseases attended by excessive motor activity. In some cases it is well to combine it with a little morphine for its effect upon the brain, and in others with potassium bromide. Conium has been employed in epilepsy, but here it is inferior to the bromides. It may, however, prove of benefit in those cases marked by vertigo and disturbance of the cerebral functions. Walshe has known it to relieve the pain of gastric cancer. For the latter disease, as well as gastric ulcer, it may be used in this combination:—

| | |
|---|---|
| ℞ Tinct. conii, | fʒss. |
| Morphinæ sulph., | gr. j. |
| Acidi carbolici, | ♏iv. |
| Syrup. acaciæ, | f℥iij. |

M. Sig.: A teaspoonful whenever in pain.

Dr. Seguin, of New York, recommends rapid increase of the dose until physiological effects are noted. He gives a drachm of the fluid extract at a dose, and never less than 20 minims. Owing to the very volatile character of the coniine it is possible to administer large doses of some old fluid extracts without getting any effects whatever. If the strong, mousey odor is missing, the preparation will have very little therapeutic value. It is also said that preparations from cultivated plants, such as the succus, or tincture of the leaves, are apt to be inert. This explains the enormous doses used by Dr. Harley (f℥ss to f℥iij or iv) of the juice. It has been likewise noticed that children bear conium-juice well. Dr. Squibb calls attention to the possible danger following dilution of the fluid extract, by which a precipitate is formed, so that toward the end a poisonous dose may be accidentally taken. Death has been caused by the administration of 150 minims of the fluid extract. The poison administered to Socrates was apparently a strong, recent infusion of conium.

## CONVALLARIA MAJALIS (U. S. P.).—Lily of the Valley.

### *Preparations.*

*Extractum Convallariæ.*—Extract of Convallaria. *Dose*, gr. v–xx.

*Extractum Convallariæ Fluidum* (U. S. P.).—Fluid Extract of Convallaria. *Dose*, ♏iij–x.

*Infusum Convallariæ.*—Infusion of Convallaria (25 parts, in water 75 parts). *Dose*, f℥ss–ij.

*Convallamarinum.*—Convallamarin. *Dose*, gr. ¼–ij.

**Pharmacology.**—Convallaria majalis (Liliaceæ), a perennial plant, is native to Europe, Northern Asia, and our Allegheny Mountains. Its rhizome is about the size of a quill, its flowers bell-shaped and six-lobed. The flowers possess a fragrant odor and a bitter, acrid taste. All parts of the plant possess medicinal value, but its virtues reside principally in the flowers. Two glucosides have been isolated, known respectively as **Convallarin** and **Convallamarin**. The latter is the active principle of the plant, but seems to be unequally distributed in its different parts, and to be present in different proportions at different stages of its growth. A fluid extract, prepared from the root or flowers, is given in doses of 5 to 15 minims. A fluid extract of the entire plant is also made, the dose of which is from 10 to 30 minims.

**Physiological Action.**—Convallarin, in doses of 3 or 4 grains, acts as a purgative, but has no marked toxic effect. Convallamarin, in small doses, excites vomiting and manifests a special influence upon the action of the heart. At first the contractions are suddenly retarded and the blood-pressure increased; subsequently the cardiac pulsations are quickened and arterial pressure further augmented. Finally, the beat is arrested. Death takes place within a few minutes after introduction of the poison. The reflex function of the cord is abolished; otherwise the action of the nervous system seems but slightly affected.

**Therapy.**—In small doses this drug strengthens the heart's action; in larger quantities it restrains excessive cardiac activity. It has been found of especial value in mitral insufficiency. It quickly relieves the dyspnœa and palpitation, and, after having been given for two or three days, may be discontinued for a week or more without recurrence of the symptoms. Convallaria seldom disagrees with the stomach, and no cumulative action has been observed. As a rule, the appetite and digestion seem to improve under its use and a regular action of the bowels is promoted.

Convallaria, and especially convallamarine, have, however, in some instances, been known to cause hæmoptysis, dyspnœa and other disagreeable symptoms. It increases the secretion of urine, and, after compensation has failed, invigorates the organ and reduces œdema. In disease of the aortic valve, though of some service, the value of convallaria is less marked. In angina pectoris and various forms of functional heart disease this remedy has proved beneficial. In chronic Bright's disease it strengthens the circulation, relieves dyspnœa, increases the flow of urine, reduces dropsy, and lessens the albuminuria. Good results have also followed its administration in cardiac debility due to pneumonia or typhoid fever. In some cases of idiopathic asthma it relaxes the spasm of the arterioles. It sometimes is serviceable in tic douloureux and other forms of neuralgia, insomnia, and the restlessness of fever. The palpitation and dyspnœa of phthisis are mitigated by the use of convallaria. It is of utility, likewise, in the irregularity of the heart dependent upon acute pneumonia, bronchitis, or emphysema, but is ineffective in fatty degeneration of the heart.

℞ Extr. convallariæ flor. fld., . . . . . . . fʒij.
Syrup. aurantii, . . . . . . . q. s. ad f℥ij.
M. Sig.: A teaspoonful to a tablespoonful three times a day. Useful in mitral insufficiency and functional heart disease.

℞ Potassii bitartratis, . . . . . . . . . f℥ss.
Extr. convallariæ flor. fld., . . . . . . . fʒiss.
Syr. simplicis, . . . . . . . q. s. ad f℥iv.
M. Sig.: From one-half to a tablespoonful, in water, three or four times a day. Valuable in general dropsy from heart or kidney disease.

### **COPAIBA** (U. S. P.).—**Copaiba.**

*Preparations.*

*Massa Copaibæ* (U. S. P.).—Mass of Copaiba (copaiba 94, magnesia 6 parts). *Dose*, gr. x–ʒss.

*Oleum Copaibæ* (U. S. P.).—Oil of Copaiba. *Dose*, ♏v–x.

*Resina Copaibæ* (U. S. P.).—Resin of Copaiba. *Dose*, gr. viii–xv.

**Pharmacology.**—Copaiba is an oleoresin obtained from Copaifera Langsdorffii and other species of copaiferæ (Leguminoseæ), coming principally from Brazil. It is not a balsam. In physical character it is a clear, transparent, oily liquid, of a pale straw color and a characteristic unpleasant odor and taste. Copaiba is insoluble in water, soluble in alcohol, ether, volatile and fixed oils. It contains a large quantity of volatile oil (the best specimens, 70 to 85 per cent.), in which two resins are dissolved. **Copaibic acid**, the principal one of the resins, is crystallizable, with faint odor and bitter taste; insoluble in water, easily soluble in absolute alcohol and in ammonia. Both the oil and the resin are medicinally active.

**Physiological Action.**—Locally applied, copaiba is slightly stimulating to the skin and mucous membrane. The taste of copaiba is peculiarly disagreeable, and it imparts its odor to the breath, being partly excreted by the bronchial mucous membrane. It is heating and irritating to the stomach, causing offensive eructations and frequently exciting vomiting and purging. Taken in medicinal doses, it soon interferes with the digestion, causing loss of appetite, disordered bowels, and diarrhœa. Copaiba is very diffusive, and stimulates secretion at its points of elimination by the kidneys, bronchial mucous membrane, and skin. Its special action is upon the mucous membrane of the genito-urinary tract, and in large amounts it gives rise to irritation or inflammation of the kidneys, in its discharge through these organs. Bloody urine, pain in the bladder, and strangury are occasional results of the administration of copaiba. It acts locally upon the genito-urinary tract, at first stimulating and subsequently checking secretions. The resin has a decided diuretic action and is also expectorant. According to Georginewski, who made numerous experiments upon dogs and rabbits, enormous doses of copaiba occasioned, in those animals, only renal congestion, but no inflammation or degeneration. The resin is preferable to the balsam since it is less apt to cause digestive disturbance. Its diuretic effects are powerful, constant and long continued.

Nitric acid, added to the urine of patients taking copaiba, causes a precipitate which resembles that of albumen, but dissolves in alcohol.

**Therapy.**—Copaiba has been used for its stimulating and antiseptic effects in chronic skin diseases, psoriasis, lupus, and leprosy, being in its action very much like gurjun-oil.

Copaiba has been used, with reported advantage, as a local remedy in frost-bites. It can be used with benefit in old ulcers. A mixture of equal parts of copaiba and resin cerate is recommended by Dr. T. G. Stephens, of Sidney, Iowa, as an efficient application to the surface of indolent ulcers.

In thickened and irritable conditions of the tongue, mouth, rectum, vagina, uterus, and the urethra it is also useful. Copaiba, applied to the urethra in gleet, is sometimes followed with a complete removal of the discharge.

℞ Copaibæ,. . . . . . . . . . . ʒss.
Liq. boro-glycerini (50 per cent.), . . . . . ʒss
M. Sig.: For application to the urethra with bougie or camel's-hair brush.

Internally, it is also given in the treatment of psoriasis, and for this purpose it is best administered in capsules, one or two hours after meals. For bronchitis, given as an expectorant, and in dropsy, for its diuretic effect, it is better to use the resin, which is nearly free from the objections to the volatile oil of causing offensive eructations. In bronchitis its effects are more decided after subsidence of the acute stage, and it is particularly valuable in chronic bronchitis associated with dilatations of the tubes and marked by a profuse purulent discharge. In ascites and some kidney disorders the resin is a valuable means of increasing the urine. Copaiba is of service also in cardiac dropsy. The remedy is not, however, invariably successful in removing these transudations, even when the conditions are apparently the same. Ringer concludes that this difference depends upon individual peculiarity, and adds that, whereas copaiba may cause bloody urine, he has seen a large amount of blood in the urine quickly disappear when copaiba was administered. The oleo-resin is principally used as an antiblennorrhetic in gonorrhœa, after the acute stage has passed, and in cystitis and pyelitis. It may be given in combination with cubebs, or in the well-known **Lafayette Mixture** (mist. copaibæ comp., N. F.) :—

| | | |
|---|---|---|
| ℞ Copaibæ, | | f℥ ij. |
| Tr. lavandulæ co., | | f℥ ij. |
| Liq. potassæ, | | fʒ iv. |
| Spiritus ætheris nitrosi, | | f℥ ij. |
| Syrupi, | | f℥ v. |
| Mucilaginis, | q. s. ad | Oj. |

M. To be well agitated when used (each fʒ = ♏viiss). Dose, a tablespoonful taken after meals.

To each dose of the above, 3 to 5 drops of oil of sandal-wood may be added, with good results.

Among the many combinations of copaiba found of service in gonorrhœa and gleet, the author suggests the following :—

| | |
|---|---|
| ℞ Resinæ copaibæ, | ʒ iiiss. |
| Oleoresinæ cubebæ, | fʒ j. |
| Saloli, | ʒ iij. |
| Pepsinæ pur., | gr. xl. |

M. et ft. capsulæ no. xl.
Sig.: From six to ten a day.

| | |
|---|---|
| ℞ Resinæ copaibæ, | ʒ iv. |
| Acidi sulphurici arom., | fʒ ij. |
| Acaciæ, | q. s. |
| Infus. rosæ, | f℥ viij. |

M. Sig. : A tablespoonful three or four times a day.

| | | |
|---|---|---|
| ℞ Resinæ copaibæ, | | ℥ ss. |
| Extracti glycerrhizæ fl., | | f℥ j. |
| Spiritus ætheris nitrosi, | | f℥ ss. |
| Acaciæ, | | q. s. |
| Aquæ cinnamomi, | ad | ℥ viij. |

M. Sig. : A tablespoonful three or four times a day.

| | | |
|---|---|---|
| ℞ Olei copaibæ, | | |
| Oleoresinæ cubebæ, | āā | ♏lxx. |
| Aloini, | | |
| Extracti belladonnæ alc., | āā | gr. j. |
| Ol. menth. pip., | | ♏j. |

M. et ft. pilulæ no xij.
Sig.: From three to six pills a day.

It is safe to begin the administration of copaiba in gonorrhœa as soon as the initial severity of the attack has subsided and the bowels have been freely opened. In the chronic cystitis of women, Dr. Whitla has derived great benefit from injection into the bladder of equal parts of copaiba and warm castor-oil. One ounce of this mixture is injected and allowed to remain until expelled. Small doses internally administered often prove serviceable in cystitis, and will also often allay irritability of the bladder dependent upon prior attacks of gonorrhœa or excessive venery.

In the gonorrhœa of females, an emulsion of copaiba is sometimes used as an injection. In certain affections of the intestinal tract this remedy is sometimes of service. Chronic diarrhœa and dysentery may improve under the administration of copaiba after other agents have failed. It may prove beneficial in chronic intestinal catarrh accompanied by ulceration, and is recommended by Allingham in chronic proctitis. Clark and others have found it useful in pseudo-membranous enteritis, given in the intervals between paroxysms. It has been used successfully in the treatment of hæmorrhoids, 20 drops being administered in capsules four times a day, or ½ drachm in combination with 15 drops of liquor potassæ, taken three times a day. Copaiba has been advantageously given by the mouth in certain inflammatory diseases of the eye, especially iritis and sclerotitis. In purulent ophthalmia it has been applied upon the skin around the orbit and instilled between the lids with good effect.

When nitric acid is added to the urine in making Heller's test for albumin, a cloud is formed if copaiba has been taken, but the application of heat causes it to disappear, and thus proves that it is not albumin.

A new substance, termed copaiba-red, has been found by Professor Quincke in the urine of persons taking copaiba. A rose-red, changing to a deeper shade, is produced by heating urine with concentrated sulphuric acid. The substance upon which this reaction depends is a colorless acid.

During the administration of copaiba, a coarse, measly rash sometimes breaks out over the body, especially in persons with a delicate skin; it also causes annoying itching. In other cases, urticaria, erythema or a bullous eruption is caused. The author has observed a rash resembling that of small-pox appear upon all portions of the body in consequence of the ingestion of copaiba.

Dr. Frederic Tresillian has observed a case in which a purpuric eruption, accompanied by febrile action, was apparently caused by the administration of copaiba.

The administration with an alkali renders this accident less likely to occur. The mass of copaiba (pilulæ copaibæ, Ph., 1870) was introduced with this object in view; but it is less efficient therapeutically than the other preparations. It may be made into pills of gr. iii–x, sugar-coated.

### COPTIS.—Coptis, Gold Thread.

#### *Preparation.*

*Extractum Coptidis Fluidum.*—Fluid Extract of Coptis. *Dose*, fʒss–j.

**Pharmacology.**—The Coptis trifolia, or gold thread (Ranunculaceæ), is a native of the temperate portions of North America and the Old World. The entire plant is used, and was formerly official. The rhizome is thread-like, and of a bright-yellow color. It is bitter to the taste, without odor. Its constituents are **Berberine**, a white alkaloid, **Coptine**, resin, but no tannin.

**Physiological Action and Therapy.**—On account of the berberine principally, coptis is a pure, bitter tonic, agreeing well with the stomach, and without astringency. It is used to increase appetite, and as a general tonic. Locally, the infusion has been employed in aphthous ulceration of the mouth, and is a good gargle in ulcerative tonsillitis. The effects of berberine are discussed below.

The East Indian variety, Coptis teeta, of which the root only is employed in medicine, contains a very large proportion of berberine,—more than any other plant known.

A prescription containing gold thread, of much value in the treatment of dyspepsia, especially when attended with diarrhœa alternating with constipation, is:—

| | | |
|---|---|---|
| R | Extracti coptidis fl., . . . . . . . . . . | f℥ij. |
| | Tinct. nucis vomicæ, . . . . . . . . . . | fʒj. |
| | Aquæ cinnamomi, . . . . . . . . . . . | f℥viij. |

M. Sig.: From one-half to a tablespoonful before meals.

**Berberine** is an alkaloid found in numerous plants (berberis, coptis, columbo, hydrastis, menispermum, podophyllum, xanthorrhiza, xanthoxylum, etc.), belonging to the natural orders Berberidaceæ, Menispermaceæ, and Ranunculaceæ. It occurs in yellow, prismatic crystals, soluble in hot water and in alcohol, but insoluble in ether. It yields bright-yellow, crystallizable salts, of which the hydrochlorate and sulphate are employed in medicinal doses of gr. ii–x. It is a bitter tonic, antipyretic, and antiperiodic, also cholagogue. It is useful in dyspepsia, malaria, and diarrhœa.

### CORIANDRUM (U. S. P.).—Coriander.

**Dose**, gr. v–xxx.

*Preparations.*

*Extractum Coriandri Fluidum.*—Fluid Extract of Coriander. *Dose*, x–xxx.
*Oleum Coriandri* (U. S. P.).—Oil of Coriander. *Dose*, ♏i–v.
*Confectio Sennæ* (U. S. P.).—Confection of Senna.

**Pharmacology.**—Coriander is the fruit of Coriandrum sativum (Umbelliferæ), native of Southern Europe. They sometimes are improperly called seeds. They have an agreeable, spicy odor, due to a volatile oil. The fruit also contains fixed oil.

**Therapy.**—This agent is used as an aromatic and stomachic, and is usually employed to prevent griping from other remedies, or as a flavoring excipient. A few drops of the oil may be given upon sugar for the relief of colic.

### CORNUS.—Cornus, Dogwood.

*Preparations.*

*Extractum Cornus Fluidum.*—Fluid extract of Cornus. *Dose*, fʒss–j.
*Extractum Cornus Floridæ.*—Extract of Cornus Florida. *Dose*, gr. i–v.

**Pharmacology.**—The bark of the root of Cornus Florida (Cornaceæ), a small tree indigenous to the United States, has decided physiological properties. It contains a crystallizable, bitter principle, **Cornin**, or cornic acid; also tannic acid, resin, etc. As the active principle is altered by air and heat, a decoction or aqueous fluid extract is not an eligible preparation in order to obtain the effect of the drug. Cornin is found also in other species of dogwood, Cornus circinata, Cornus sericea, etc.

**Physiological Action and Therapy.**—Cornus belongs to the class of vegetable bitters, and is used as a stomachic tonic to increase appetite, etc. It has also considerable reputation for control over malarial manifestations, and is considered the best substitute for cinchona among the native astringent bitters.

## CORONILLA.

**Dose,** gr. v–xx.

**Coronillin,** gr. i–ix.

**Pharmacology.**—Coronilla varia (Leguminosæ) is a shrubby plant, the flowers of which are arranged in little tufts resembling coronets. The active principle is a glucoside, which has been termed coronillin.

**Physiological Action.**—The drug possesses an unpleasant, bitter taste, but it increases the appetite and never excites gastro-intestinal disorders even when given in large doses.

Spillmann and Haushalter have studied the effects of coronillin upon the human subject. They determined the maximum dose of the extract of coronilla to be 23 grains and that of coronillin to be 9¼ grains. As a result of their investigations they concluded that coronilla is a cardiac tonic, the beneficial effects of which are manifested within twenty-four to thirty-six hours after ingestion, do not increase from its farther administration and disappear within twenty-four hours after the last dose has been given.

**Therapy.**—In organic affections of the heart coronilla increases the volume of the pulse, augments diuresis, diminishes œdema, and relieves dyspnœa.

Coronilla is generally applicable to the same cases in which digitalis also succeeds, and is powerless in those conditions of degeneration in which digitalis fails.

It regulates and reduces the action of the heart in tachycardia and abolishes painful reflex manifestations. In lesions of the mitral and aortic valves it is especially beneficial. The paroxysms of dyspnœa dependent upon organic disease of the heart are mitigated by this remedy. A tincture has been used in doses of ½ to 1 fluidrachm.

Poulet witnessed good results from the employment of this remedy in influenza, especially in those cases attended by irregular febrile paroxysms.

Coronilla has no cumulative effect and does not disturb the digestive functions.

## CORYDALIS (U. S. P.)—Corydalis, Turkey Corn.

### *Preparation.*

*Extractum Corydalis Fluidum.*—Fluid Extract of Corydalis. *Dose,* ♏xv–f℥j.

**Pharmacology and Therapy.**—The Dicentra Canadensis (Fumariaceæ) a native of the northern part of this country, has some reputation as an alterative, especially used as a tonic in syphilis and other conditions of debility. The tubers are the part of the plant used; they contain an alkaloid, **Corydaline,** combined with **fumaric acid,** also acrid resin and bitter extractive. Corydaline has been given in doses of 1 to 5 grains.

### COTO CORTEX.—Coto Bark.

*Preparations.*

*Pulvis Coto Corticis.*—Powder of Coto Bark. *Dose,* gr. v–xxx.
*Extractum Coto Corticis Fluidum.*—Fluid Extract of Coto Bark. *Dose,* ♏xii-xxx.
*Tinctura Coto Corticis.*—Tincture of Coto Bark. *Dose,* ♏x–xv.
*Cotoina.*—Cotoine. *Dose,* gr. ss–j.
*Paracotoina.*—Paracotoine. *Dose,* gr. ss–ij.

**Pharmacology.**—Coto bark is obtained from Bolivia, but its botanical origin is still undetermined. Several authors believe that it comes from a member of the natural order Lauraceæ, and this statement is adopted by the National Dispensatory of 1886. It is received in the form of flat or curved pieces a foot or more in length and ¾ inch broad. Externally it is of a cinnamon-brown color, but when broken it appears studded with numerous scattered golden-yellow spots. It has an aromatic odor, which is more perceptible when the bark is bruised. The powder is very irritant to the Schneiderian mucous membrane. The taste is aromatic, sharp, and slightly bitter, but not astringent. The active principle is a crystallizable substance termed **Cotoine,** of a pale-yellow color, slightly soluble in cold water, but soluble in hot water, alcohol, ether, chloroform, and alkaline solutions. Cotoine is precipitated by hydrochloric acid with a clear, yellow color. It is colored blood-red by nitric acid, brownish yellow by sulphuric acid, and black by ferric chloride. Cotoine possesses a rather acrid taste and has an irritant effect upon the Schneiderian mucous membrane. A bark differing in external appearance from coto, but similar in chemical composition and therapeutic effects, and probably derived from an allied species, has been designated paracoto. Paracoto contains an active principle called **Paracotoine,** analogous to cotoine in composition and effects, but feebler. Powdered paracoto is unirritant to the nasal mucous membrane. Paracotoine is of a bluish color, and but slightly soluble in boiling water. Paracotoine is soluble in alcohol, ether and, particularly, in chloroform.

**Physiological Action.**—Applied to the unbroken skin, powdered coto causes heat and redness. Taken internally, it gives rise to a sensation of warmth in the stomach, and in large doses to nausea and vomiting. It stimulates the secretion of saliva. Small doses may increase the appetite. It is eliminated in the urine. Coto retards the development of bacteria and the occurrence of putrefaction. It causes active dilatation of the intestinal blood-vessels. Coto does not produce constipation in healthy individuals.

**Therapy.**—Coto and paracoto are remarkably efficient remedies in diarrhœa. They are applicable to all varieties of the disorder, except that dependent upon ulcers of the bowel, in which they have generally failed. Abundant testimony exists as to its worth in functional diarrhœa, acute and chronic gastro-intestinal catarrh, cholera infantum, the diarrhœa of typhoid fever, of rachitis, insanity, and in that form resulting from reduced nutrition. It is exceedingly valuable in the treatment of tuberculous diarrhœa, and is at the same time of service in reducing the fever and checking the night-sweats. Professor Baelz, of Tokio, Japan, successfully treated five cases of Asiatic cholera by hypodermic injections of paracotoine. Coto has been found effective also in hyperidrosis. In a case mentioned by Dr. J. Burney Yeo, coto not only arrested the diarrhœa of a severe case of exophthalmic goitre, but also seemed to have a remarkable influence upon the nervous phenomena. Yeo recommends the following mode of administration:—

| | |
|---|---|
| Fluid extract of coto, | 1 drachm. |
| Compound tincture of cardamom, | 1 " |
| Mix these together and slowly triturate them with | |
| Mucilage of acacia, | 3 drachms. |
| Simple syrup, | 2 " |
| Water, enough to make 6 fluidounces. | |
| Dose, a tablespoonful. | |

This is an opaque mixture of a not unpleasantly warm and aromatic taste. Two or three doses generally arrest or check the severest forms of tuberculous diarrhœa. The author has employed the following prescription in chronic and in tuberculous diarrhœa, the effect being complete cessation of all discharge:—

| | |
|---|---|
| ℞ Extracti coto cort., | f ʒ ij. |
| Extracti hamamelidis fl., | f ℥ ss. |
| Aquæ cinnamomi, | f ℥ x. |
| M. Sig.: A dessertspoonful every three or four hours. | |

Laborde prepared a wine of coto according to the following formula:—

| | |
|---|---|
| Coarsely-powdered coto-bark, | 30 grammes. |
| Malaga wine (16 degrees), | 1000 " |
| Macerate for ten days, shaking occasionally, and filter. | |

Professor Albertoni, to whom we owe the most comprehensive study of the physiological action of coto, observed no favorable results in drunkards or where the portal circulation was embarrassed. as in cirrhosis. He considers it contra-indicated when there is hyperæmia of the bowel and a tendency to intestinal hæmorrhage. For the same reason it should be used with circumspection in acute intestinal catarrh. According to this writer the beneficial effects of coto are due to its favorable influence, through active dilatation of the blood-vessels, upon the intestinal epithelium, promoting its nutrition and modifying its physiological functions.*

**CREOSOTUM** (U. S. P.).—**Creosote.**
**Dose, ♏i–iij.**

*Preparations.*

*Aqua Creosoti* (U. S. P.).—Creosote-Water (1 per cent.). *Dose*, f ʒ ss–iv.
*Unguentum Creosoti.*—Ointment of Creosote (♏xxx–℥j).

**Pharmacology.**—Creosote is the product of the distillation of wood-tar, or, more correctly, one of the products of the distillation of wood, separated from tar by fractional distillation; it was discovered in 1830 by Reichenbach. It is largely contaminated or substituted in commerce by a similar substance obtained from the distillation of bituminous coal, made up of carbolic and cresylic acids principally. Wood-tar creosote is chiefly composed of the following phenols, **Guaiacol**, **Creosol**, **Methylcreosol**, and **Phloral**. The creosote made from beechwood is of a reddish amber color; it is the best for medicinal use. It is an oily liquid, nearly colorless; of smoky odor, caustic taste, and neutral reaction; soluble in 80 parts of water, and in all proportions of alcohol, ether, etc. Pure creosote should have a specific gravity of 1067 and distill at a temperature of 200° to 210° C. (392° to 410° F.). It differs from carbolic acid in being less caustic and in not coagulating collodion or albumin,* but has probably equal, if not superior, antiseptic effects, as seen in its power of preserving meat, from which it derives its name. With the tincture of the chloride of iron, an alcoholic solution of creosote develops a deep, greenish-blue color; but carbolic acid produces a light brown.

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* See paper by author, "The Physiological and Therapeutical Action of Coto-Bark," in *Medical Bulletin* for February, 1891.

**Physiological Action.**—Creosote is a local sedative. A strong solution applied to the integument may give rise to erythema, œdema, itching and pain. Internally, it very closely resembles the effects of carbolic acid as an anæsthetic antiseptic and astringent. It escapes from the body by the bronchial mucous membrane in part, and has expectorant powers; it is principally excreted by the kidneys. Both absorption and elimination of creosote occur with marked rapidity. It has been found in the sputum of tuberculous subjects.

Creosote has a special sedative action upon the nerves of the stomach and allays irritability and nausea. It has a similar effect upon the bronchial mucous membrane when its vapor is inhaled with the vaporizer or steam-atomizer. Dr. Irsai, of Buda-Pesth, has demonstrated by experiment that inhalation of creosote and guaiacol gave rise to decided hyperæmia of the lungs. In overdoses, creosote causes giddiness, depressed action of the heart, faintness, convulsions, or coma. The antidotes are probably the same as those to carbolic acid, since Hare has found that the soluble sulphates are efficacious antidotes to creosote-poisoning.

**Therapy.**—As a local anæsthetic, creosote is largely used by dentists in aching teeth with sensitive dentine, and as an application to an exposed nerve-pulp; the remedy being taken up on a little absorbent cotton, and excess removed by allowing it to rest upon blotting-paper before being inserted into the cavity of a tooth, from which *débris* of food or other material should first be removed by syringing with warm water. Creosote-water has some hæmostatic qualities, and is an antiseptic dressing of value in sloughing ulcers, or for injection into sinuses. In gleet and other catarrhal diseases, creosote often acts well when used as follows:—

℞ Creosoti, . . . . . . . . . . . ♏v.
Ext. geranii fl., . . . . . . . . . . fʒss.
Aquæ rosæ, . . . . . . . . . . . f℥iv.

M. Sig.: Inject night and morning into the urethra,—alone or slightly diluted with warm water.

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* The United States Dispensatory says that creosote "powerfully coagulates albumin."

Creosote is believed to have special value in the treatment of burns and in chilblains. In skin diseases of a scaly character and pruritus, creosote is a useful application; and in erysipelas the ointment is of benefit in relieving the pain and reducing the inflammation. This ointment relieves the itching and burning of erythema multiforme and of eczema, and is beneficially applied to ulcerated surfaces and psoriasis. Creosote ointment is very advantageously prescribed in connection with lead carbonate, as:—

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| ℞ Plumbi carbonatis, | ʒj. |
| Unguenti creosoti, | ℥j. |

M. For erysipelas, erythema, acute eczema, and burns.

A gargle containing creosote in sloughs of the mouth or throat, purifies the breath, and stimulates the ulcer to repair.

For catarrhal laryngitis, and tubercular disease of the air-passages creosote can be sprayed over the surface as in this prescription:—

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| ℞ Creosoti, | fʒj. |
| Tinct. benzoin. co., | fʒij. |
| Aquæ hamamelidis dest., | |
| Glycerini, | āā f℥iss. |

M. Sig.: Use in an atomizer. Spray over the surface three or four times a day.

It is inadvisable to make use of the spray if a tendency to pulmonary hæmorrhage is present. Dr. John Dunn, of Richmond, Va., uses in atrophic rhinitis:—

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| ℞ Ol. anisi, | ♏xx. |
| Creosoti, | ♏xx. |
| Vaselin, | ℥j. |

M. Sig.: Introduce a small piece within the nostril.

Taken into the stomach, it checks fermentation and reduces irritability, checking nausea and correcting the causes productive of diarrhœa. In fermentative dyspepsia the following combination is recommended by Dr. B. W. Richardson:—

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| ℞ Ol. creosoti pur., | ♏xij. |
| Sp. tenuoris, | f℥iiss. |
| Ammon. benzoat., | ʒij. |
| Glycerin pur., | fʒvj. |
| Infus. caryophyll., | f℥vj. |

M. Sig.: Tablespoonful two or three times a day, between meals, in water.

It is a useful remedy in sea-sickness and the vomiting of pregnancy, and in the summer diarrhœa of adults as well as of infants.

In obstinate vomiting of pregnancy Kaatzer prescribes:—

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|---|---|
| ℞ Creosoti pur., | fʒss. |
| Sp. vini rectificat., | f℥j. |
| Tr. gentian. co., | fʒiiss. |
| Extr. caffeæ, | ʒijss. |
| Aq. destillat., | f℥iij. |

M. Sig.: To be well shaken. Dose: teaspoonful two or three time a day in milk.

Creosote has given good results in the treatment of intestinal hæmorrhage, gonorrhœa and gleet. In sea-sickness the nausea and vomiting may be overcome by this combination of creosote:—

℞ Creosoti, . . . . . . . . . . . . . ♏v.
  Morphinæ sulphatis, . . . . . . . . . gr. j.
  Aquæ menth. pip., . . . . . . . . . . f℥iij.
M. Sig.: A teaspoonful every two or three hours until relieved.

In chronic bronchitis, bronchorrhœa, and phthisis, creosote has been given with marked benefit, especially where cavities have formed, as in the following combinations:—

℞ Creosoti, . . . . . . . . . . . . . ♏i–iij.
  Tr. gentianæ comp., . . . . . . . . . ♏xxx.
  Spiritus frumenti, . . . . . . . q. s. ad fʒij.
M. Sig.: Take four times daily.

℞ Creosoti,
  Tinct. capsici, . . . . . . . . . . āā fʒj.
  Syrup. acaciæ, . . . . . . . . . . . f℥j.
  Syrup. limonis, . . . . . . . . . . . f℥iv.
M. Sig.: A teaspoonful with water after meals.

℞ Creosoti, . . . . . . . . . . . . . fʒss.
  Syrup. ferri iod.,
  Glycerini, . . . . . . . . . . . . āā f℥iij.
M. Sig.: A teaspoonful in water three or four times a day.

A combination employed by Professor Bouchard in the treatment of pulmonary tuberculosis is:—

℞ Creosoti, . . . . . . . . . . . . . ʒj.
  Balsam tolutan., . . . . . . . . . . fʒj ¾.
  Terebinthin, . . . . . . . . . . . . gr. xv.
  Acid. benzoici, . . . . . . . . . . . q. s.
M et. ft. pil. no. lxxx. Sig.: Ten pills to be taken daily.

Creosote may be given in a pill, or the prescribed number of drops added to a teaspoonful of old Jamaica rum, diluted with water. In a considerable proportion of cases, cough and expectoration are diminished and fever and night-sweats are lessened. It is also given in tuberculosis by hypodermic injection. P. Carles recommends for hypodermic injection a mixture consisting of 10 parts of beechwood creosote, 80 parts of tincture of quillaia and 60 parts of distilled water. The creosote is said to be dissolved by aid of the saponin and not merely suspended. The liquid is thought to be better adapted to the purpose than the ordinary emulsions of creosote. It can be diluted to any extent with either cold or warm water. Dr. G. Bell is in the habit of prescribing creosote with compound fluid extract of cinchona and administering it diluted with milk. Creosote has also been administered with some success to consumptives in the form of a rectal injection. It is stated to have been well tolerated by the bowel, that it reduced fever and in some cases arrested diarrhœa. The taste of creosote was perceived in the mouth in a few minutes after the injection had been made. Another evidence of rapid absorption was the occasional occurrence of green or dark colored urine.

In the treatment of tuberculosis creosote is, perhaps, the most valuable drug which we possess. Sommerbrodt, who introduced this method of therapy, was accustomed to increase the dose rapidly until the point of tolerance had been attained. He generally gave the remedy mixed with codliver-oil or olive-oil, and enclosed in a capsule. Under the influence of creosote, the bacilli may disappear from the sputum and the physical signs improve. In conjunction with its internal employment Dr. Beverley Robinson, of New York, recommends frequent and prolonged inhalation of the drug. Inhalations often improve the condition of the larynx and relieve an obstinate cough. According to Sommerbrodt, the earlier the creosote treatment is adopted in tuberculosis the more favorable are the results. He has used it with advantage in scrofula. M. Burlureaux ascribes prognostic value to creosote in tuberculosis. The cases in which it is not well borne are, as a rule, beyond hope. Patients by whom it is tolerated are generally improved. Dr. F. Velten reports excellent results from the use of creosote in tubercular pleurisy with effusion. The effusion, fever and other symptoms of pleurisy gradually disappeared.

Dr. G. Bell derived decided benefit from the administration of creosote in a severe case of perinephritis. In cases of suppurating glands, also, he has witnessed good results from its use and suggests that it may act as a preventive of possible tubercular infection. This writer believes, moreover, that it is of advantage in pyæmia.

As creosote contains from 60 to 90 per cent. of **Guaiacol**, Sahli has proposed that the latter body should be employed instead of creosote in the treatment of phthisis. Guaiacol is a colorles liquid, sparingly soluble in water, but very soluble in ether, alcohol, and fatty oils. It is more agreeable in odor and taste than creosote, and is said to be better borne. It improves the appetite and digestion and prevents or relieves flatulence. It is probably eliminated by the lungs, exerting a directly local beneficial action. Guaiacol is usually given in single doses of 5 drops or in daily quantities of 20 to 40 drops. It indirectly reduces hectic fever and checks night-sweats. When given at an early stage of the disease, the bacilli diminish remarkably in number and may even entirely disappear. Labadie-Lagrave has advantageously prescribed guaiacol in the form of pearls or capsules. Bourget, of Geneva, prescribes it dissolved in wine or codliver-oil.

Continued experiment in the laboratory, however, has shown that liquid guaiacol is not a chemically pure product, but a mixture in varying proportions, of guaiacol, creosote, and cresylol. The actual proportion of guaiacol present in different samples varied from 10 to 50 per cent. Pure guaiacol has been synthetically prepared and occurs in the form of colorless rhomboidal crystals, almost insoluble in water, soluble in alcohol, oil and anhydrous glycerin. Its taste is somewhat sweet, but is followed by a pungent and burning after-taste. M. M. Gilbert and Maurat observed that the principal effects of poisoning with pure guaiacol were enfeeblement and retardation of the heart's action and the breathing. Most of the secretions were augmented, and especially that of the lachrymal gland. At the moment of death, which takes place under coma, the temperature may fall as low as 68° F.

Liquid guaiacol has been given in enema and its vapor has been inhaled. It has also been introduced into the system by subcutaneous injection in the daily dose of 8 to 16 minims. Professor Peter speaks favorably of the use of the drug hypodermically, but adds the caution that its effects must be carefully watched, as it is capable of causing hæmoptysis, pneumonia, acute phthisis and fat embolism. Signs of evil import are the production of a persistent bad taste in the mouth, a dark-colored urine and a marked rise or fall of temperature. Injections of guaiacol have yielded good results in fetid bronchitis, chronic bronchitis and bronchial dilatation. In lupus Dr. Moreau, of Tours, advises the hypodermic injection twice weekly of a solution of guaiacol and thymol in sterilized olive-oil. The mixture which he employs contains 30 grains of thymol in 1½ ounces each of guaiacol and sterilized oil. Of this preparation 15 minims are at first injected and the quantity is gradually increased to 45 minims. The injections are followed by considerable local and general reaction. After six or seven injections had been given the nodules generally underwent retrocession and ulcers cicatrized. The treatment may produce serious symptoms and is scarcely suitable for use when pulmonary or cardiac lesions are present. The injections are painful. A combination of guaiacol and aristol was also used, but was abandoned as being more painful than the mixture with thymol.

Guaiacol is readily absorbed by the skin, and it has been found that a local application has the power of reducing febrile temperature. The remedy is painted upon an area varying in size from 4 to 20 square inches and prevented from evaporating by being covered with an impermeable dressing. This method has been made use of in tuberculosis, erysipelas, pneumonia, articular rheumatism, scarlatina and typhoid fever. The reduction of temperature is accompanied by free perspiration. The quantity employed was, as a rule, 30 drops. The application gave rise to no depression of the circulation or respiration, albuminuria or other evidence of renal irritation, although it is advised to watch the kidneys. Professor Da Costa believes that the local application of guaiacol is of advantage where the cold bath treatment is impracticable or where there is a tendency to intestinal hæmorrhage. The applications have been made upon various portions of the integument without any noticeable difference of result. They occasioned increased diuresis. Dr. S. Solis-Cohen believes that the application of guaiacol to the throat has a prophylactic power against diphtheria. He employs a mixture of 10 parts of guaiacol, 1 part of menthol and 10 parts of olive-oil.

Drs. Friedenwald and Hayden have recently reported* a series of seventeen cases in which guaiacol was thus applied. Among the diseases treated by this method were pneumonia, typhoid fever, pulmonary tuberculosis, malarial fever, influenza, rheumatism and erysipelas. A powerful antipyretic action was observed in these cases. Dr. Ferrand asserts that the local application of equal parts of guaiacol and glycerin is serviceable in allaying the pain of sciatica and the chest pains of tuberculosis. Professor J. M. Anders has used it hypodermically in sciatica and supraorbital neuralgia, 2 drops of guaiacol being mixed with 10 drops of chloroform. He has given it internally with benefit in gastralgia. The absorption of pleural effusions is, according to Sigalea, promoted by painting upon the surface once daily for several days a mixture thus composed:—

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* *New York Medical Journal*, April 14, 1894.

℞ Guaiacol, . . . . . . . . . . . gr. xlv.
Glycerin.,
Tr. iodin., . . . . . . . . . . . āā f℥v.
M.

In scarlatinal nephritis with anasarca and suppression of urine the same procedure has been productive of benefit.

Paintings of guaiacol have been found by Balzer and Lacour to be beneficial in orchitis, relieving pain and reducing temperature, though it did not seem to have the power to promote absorption of inflammatory products. The drug was used undiluted upon the inguinal region, but upon the scrotum it was applied in the form of an ointment containing from 30 to 75 grains to the ounce of excipient.

**Guaiacol Carbonate.**—This substance is a fine crystalline powder devoid of taste or smell, insoluble in water, slightly soluble in cold alcohol, soluble in hot alcohol, ether and chloroform, slightly soluble in glycerin and fatty oils, the average dose in which this compound is given being 5 grains. This amount may be gradually increased to 8 grains. It has been used by Seifert and Koelescher in a number of cases of tuberculosis. These authors state that it causes no irritation of the gastro-intestinal mucous membrane, that it passes through the stomach unchanged and is decomposed in the intestine into guaiacol and carbonic-acid gas. According to De Grazia and Casaretti, this decomposition may take place in the stomach in the presence of fermentation. Seifert and Koelescher witnessed improvement as regards cough, appetite and nutrition in consequence of its employment. They administered a drachm and a half of the drug in divided doses during the twenty-four hours. Guaiacol carbonate has also been given with advantage in typhoid fever by Dr. F. Hölscher, who remarked that it produced a moistening of the tongue, and an improvement in the character of the stools. The remedy had a favorable influence upon the bronchitis which accompanied the fever, disinfected the bowel and generally prevented extreme prostration and severe cerebral symptoms. He gave the drug in the dose of 15 grains night and morning.

This compound is not a direct antipyretic, but when given in combination with acetanilid the influence upon the temperature is marked. Dr. F. C. Simpson, of Louisville, reports excellent results from the employment of guaiacol carbonate in intestinal troubles due to neurasthenia.

**Guaiacol Phosphite.**—This is a definite chemical combination, first prepared by M. Ballard, and which promises to prove of therapeutical efficacy. It is a white, crystalline powder, of a warm taste but not caustic. The compound is very soluble in alcohol, ether, water, chloroform and fatty oils; slightly soluble in turpentine and glycerin. It contains 92.25 per cent. of guaiacol and 7.75 per cent. of phosphorus. Daily doses of 1 to 1½ drachm were given to dogs without evil consequences; half an ounce caused coma and death a few hours after administration. From 2½ to 3 drachms seemed to be a maximum safe dose.

**Benzoyl-guaiacol.**—This substance is a crystalline powder, destitute of odor or taste, insoluble in water, soluble in ether, chloroform and hot alcohol. It is a compound of benzoic acid and guaiacol. It is split up in the bowel into its constituents. It is well borne even in large doses. It diminishes cough, expectoration and râles, but has no effect upon the bacilli. Benzoyl-guaiacol may be prescribed in the dose of 4 grains three times a day, or daily doses of 15 to 75 grains. Benzoyl-guaiacol, known also as benzosol, may be given with chocolate and sugar. According to the clinical experiments of Professor Rummo, corroborated by those of De Grazia and Casaretti, benzoyl-guaiacol is the most efficient succedaneum of creosote or guaiacol.

Other salts or compounds of guaiacol have been prepared, as guaiacol cinnamate (cinnamyl-guaiacol or styracol), guaiacol salicylate (guaiacol salol or salicyl guaiacol), etc.

**Guaiacol-di-iodide.**—This compound is obtained from soduim-guaiacol by the action of iodine and potassium iodide. It is a reddish-brown salt and possesses an odor similar to that of iodine. It is soluble in alcohol and fatty oils, but rapidly decomposes. Guaiacol-di-iodide is given in the same doses and for the same purposes as guaiacol.

**Guaiacol-salicylate.**—This salt occurs in the form of white crystals, free from odor, soluble in alcohol, insoluble in water. Its dose and therapeutical applications are the same as those of salol.

**Creosote Carbonate,** or creosotal.—A combination of beechwood, creosote and carbonic acid forms an amber-colored, clear, neutral, oily liquid, of a sweetish taste, without odor. The compound contains 90 per cent. of creosote. At ordinary temperatures it is viscid, but is easily liquefied by moderate heat. It is not irritating to mucous membranes and is stated to be much less toxic than creosote. Creosote carbonate is insoluble in water, glycerin and weak alcohol. It is soluble in all proportions in 95 per cent. alcohol, in ether, chloroform, and soluble in 4 or 5 parts of codliver-oil or olive-oil. In the bowel it is separated into creosote and carbonic acid. It is said to improve the appetite and effect a gain in weight and strength. Creosote carbonate is given to children in daily doses of 15 grains, increasing to 1½ drachm; to adults in daily doses of 1 drachm, increasing to ½ ounce in divided doses. It can be administered in capsules, dissolved in codliver-oil, or made into an emulsion with the yelk of an egg, diluted with water, sweetened and flavored.

**Creosote Calcium Hydrochlorophosphate.**—Under this cumbrous designation a mixture of creosote carbonate and dry calcium hydrochlorophosphate has been used in phthisis and scrofula. The mixture is a white, syrupy mass and is administered in emulsion in the dose of ½ to 2 grains twice a day.

**Oleocreosote.**—An oleic ether of creosote, obtained by the interaction of oleic acid and creosote, is preferred by some authorities as being tolerated in larger doses than a simple mixture of creosote and oil.

It is of a yellowish color and oily consistence, and contains 33 per cent. of creosote, is insoluble in water, slightly soluble in alcohol, but dissolves in ether, chloroform and fatty oils. Oleocreosote is comparatively devoid of caustic properties and is well borne by the stomach.

Dr. Clemens has observed improvement in diabetes mellitus from the use of 18 to 30 drops of guaiacol thrice daily, suspended in milk or codliver-oil. The polyuria was markedly restrained, the general condition was improved and, after four weeks of treatment, the patients could partake of some saccharine foods without increasing the glycosuria.

Professor Schueller administers guaiacol stirred into some salt water, milk or soup, or, for adults, in a glass of wine, preferring this method to the exhibition in pills or capsules. In many instances he gives it by inhalation, weak aqueous solutions (5:3000 or 5:5000) being employed. He has obtained good results from guaiacol, not only in pulmonary tuberculosis, but in lupus, hip-joint and Pott's disease.

M. Picot has met with very encouraging results from the hypodermic injection of a mixture of guaiacol and iodoform. As an excipient he employs sterilized olive-oil and vaseline, each cubic centimetre (15 minims) of the base containing 1 centigramme ($\frac{1}{6}$ grain) of iodoform and 5 centigrammes ($\frac{5}{6}$ grain) of guaiacol. This combination is modified by M. Pignol, who adds 14 centigrammes ($2\frac{1}{6}$ grains) of eucalyptol to each cubic centimetre and omits the vaseline from the base. Dr. R. Robertson approves of this method of treatment in empyema, provided that free drainage is maintained. Dr. William H. Gregg recommends the administration of guaiacol in the form of an enema. Guaiacol cinnamate has been introduced under the name of styracol and praised in the treatment of tuberculosis.

Styracol is prepared by heating together guaiacol and cinnamyl chloride and occurs in the form of crystalline needles, without color and practically insoluble in water. Styracol has been used as an intestinal antiseptic and in gonorrhœa, chronic cystitis and pulmonary tuberculosis. As a local application it has been employed to promote the healing of wounds and ulcers.

Dr. Charles Eloy, of Paris, recommends creosote to be given in emulsion, as follows:—

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| ℞ Ol. amygdal. dulc., . . . . . . . . . . | f℥v. |
| Creosoti, . . . . . . . . . . . . . . | fʒij. |
| Misce et adde | |
| Pulv. acaciæ, . . . . . . . . . . . . | f℥ii ʒv. |
| Aq. menth. pip., . . . . . . . . . . . | f℥xvj. |
| M. Sig.: From two to five tablespoonfuls a day. | |

Seitz prefers to combine creosote with codliver-oil and makes an emulsion with the aid of saccharin. Both creosote and guaiacol have been injected beneath the skin or into the lung. Creosote affords relief in flatulent dyspepsia, sarcina ventriculi, and gastralgia. It can be prescribed, in the diseases just referred to, as follows:—

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|---|---|
| ℞ Creosoti, . . . . . . . . . . . . . | ♏v. |
| Tinct. capsici, . . . . . . . . . . . . | fʒss. |
| Aquæ sodæ menth., . . . . . . . q. s. ad | f℥iij. |
| M. Sig.: A teaspoonful in water at meals. | |

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|---|---|
| ℞ Creosoti, . . . . . . . . . . . . . . | ♏vj. |
| Glycerini, | |
| Syr. acaciæ, . . . . . . . . . . . . āā | f℥iss. |
| M. Sig.: A teaspoonful before meals. | |

Creosote has been successfully employed in diabetes mellitus by

P. Valentin, who gave it in daily doses of 4 drops, increased gradually to 10 drops. The sugar soon disappeared, and did not return even when a diet containing starch and sugar was allowed. Similar results have been reported by Audubert. Good results have been obtained from creosote in typhoid fever, diphtheria, scarlet fever and erysipelas. A. Atkinson has found it efficacious in the treatment of tape-worm. A mixture of creosote, spirit of chloroform, and tincture of lavender may be used in an inhaler in diseases attended with profuse, bad-smelling expectoration. This mixture, or those of similar composition, all prove of great value in removing the offensive odor of gangrene of the lung in phthisis, laryngitis, chronic bronchitis and also in asthma:—

℞ Creosoti,
Ethyl iodidi,
Terebenis, . . . . . . . . . . āā fʒj.
M. Sig.: For inhalation. Ten to twenty drops in an inhaler when necessary.

℞ Creosoti,
Eucalyptolis,
Terebenis, . . . . . . . . . . . āā fʒj.
M. Sig:: For inhalation. Ten to twenty drops, as necessary.

℞ Creosoti,
Thymoli,
Spiritus vini rectificat., . . . . . . . āā fʒj.
M. Sig.: For inhalation. Ten to twenty drops.

Koch's method of treating erysipelas consists in applying the following ointment, spread evenly with a camel's-hair pencil, in a thin layer over the affected part:—

℞ Creosoti vel Creolini, . . . . . . . . . . fʒj.
Iodoformi, . . . . . . . . . . . . ʒiv.
Lanolini, . . . . . . . . . . . . ʒx.
M. After applying the ointment as directed, cover the surface with a thin sheet of gutta-percha or rubber cloth.

Dr. Soupault recommends the administration of creosote in full doses after tracheotomy in diphtheria and also the application externally over the tube of a 1 to 30 solution in alcohol and glycerin. Dujardin-Beaumetz speaks of a patient who was at once tuberculous and leprous, and in whom rapid amelioration was produced by hypodermic injections of creosote. The anæsthetic patches of lepra, which had been utilized in inserting the needle, had almost entirely disappeared. Creosote, in doses of half a minim and upwards three a four times a day, has been recommended in the treatment of whooping-cough and has been employed in the laryngeal and bronchial manifestations of influenza. Vehsmeyer made use of creosote in a case of typical leukæmia in a nine-months-old child. The spleen diminished in volume and the mucous membrane gained some color and, after some months, the blood had become almost normal. The child subsequently died of convulsions, but in view of the general amelioration it is suggested that further experiment should be made with the drug in the case of adults.

In addition to the repugnance which creosote soon excites in patients, it has been surmised that the creosol which the substance contains is liable to induce local inflammation at the spot in the stomach where the capsule has been dissolved.

**Creosol.**—This is a compound of creosote and tannic acid, a brown, hygroscopic powder, soluble in water, alcohol and glycerin, insoluble in ether, an astringent and antiseptic. It has been given in daily doses of 45 grains and is reported as of service in laryngitis and bronchitis.

**CREOLINUM.—Creolin.**

**Dose,** ♏ii–v.

**Pharmacology.**—Creolin is obtained from English coal by dry distillation, the carbolic acid being separated and the residue emulsified by a special process with the addition of caustic soda. The details of its mode of manufacture, however, have not yet been published. It is a syrupy, dark-brown, or blackish fluid of a tar-like odor. It mixes with water in all proportions, forming an opaque, whitish emulsion. It is soluble in alcohol. The exact chemical constitution of creolin has not been determined, but it seems to consist largely of hydrocarbons joined with phenols free from any trace of carbolic acid, together with a small proportion of organic bases of the pyridine order and alkaline ash.

**Physiological Action.**—A 3-per-cent. aqueous dilution excites no irritation when applied to the skin. When the skin is subjected to the action of a 5-per-cent. dilution for a considerable time, a slightly burning sensation results, but soon disappears. Creolin is irritant to mucous membranes. It is an efficient germicide, in some respects more powerful than carbolic acid. It is more destructive than carbolic acid to the micro-organisms of typhoid fever, Asiatic cholera, and suppuration; while, upon dried spores of the anthrax bacillus, carbolic acid exerts a more powerful inhibitory influence than creolin. Carbolic acid is likewise the more efficacious and permanent disinfectant of putrefaction. Creolin possesses the advantage of being much less toxic. It was at first, in fact, supposed to be entirely devoid of toxicity. This claim can be no longer upheld, since several patients, especially among the 2,000 midwifery cases reported by Dr. Bitter,* of Breslau, showed symptoms of nausea, chill, fever, dyspnœa, collapse, and albuminous urine following its use. In one case reported, a scarlatiniform rash, with thirst, fever, and itching of the skin, was produced. In another instance, however, as much as 8 ounces were used without fatal consequences.

The application of creolin has also been known to produce eczema, erythema, vesicular eruptions, and desquamation of the skin in large patches, together with more or less severe constitutional disturbance. Dr. Fliesburg has reported a fatal case in a babe, three weeks of age, to whom 30 drops of undiluted creolin had been given by mistake. Death occurred twenty-seven hours after ingestion of the liquid. The symptoms of intoxication were spasm of the glottis, cyanosis and cold sweats, with weak and rapid pulse. Albumin and blood were found in the urine, the odor of which resembled that of carbolic acid. Subsequently a slight jaundice made its appearance. The addition of 1 or 2 per cent. of creolin removes the characteristic odor of iodoform.

**Therapy.**—It is almost exclusively as a local application that creolin has been used, though it has been administered internally in a few instances with the effect of preventing gastro-intestinal fermentative processes. As an efficient and safe antiseptic, it is very advantageously employed in a 1- or 2-per-cent. solution to irrigate accidental or surgical wounds. A 2-per-cent. dilution in olive- or linseed-oil, applied upon absorbent cotton, is an excellent dressing to abscess-cavities, sinuses, to wounds left after resection of bone, removal of a sequestrum, to compound fractures, sloughing ulcers of the leg, etc. In addition to its parasiticide virtues, it is additionally serviceable as a dressing to fresh wounds from its hæmostatic properties, promptly arresting the oozing from divided capillaries. A weak dilution of creolin in water or alcohol makes a good wash in ozæna. Five or six drops may be added to a pint of water, or we may follow the method of Moure and prescribe:—

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* *British Medical Journal*, December 13, 1890.

| | |
|---|---|
| ℞ Creolini, | ♏xv. |
| Spt. vini rect., | f℥iiss. |

M. A teaspoonful of this solution is added to a quart of tepid water.

Schnitzler has used creolin in diseases of the larynx, especially tuberculosis, by inhalation (1 part in 1000 of water), by insufflation (from 1 to 5 parts to 100 of sugar of milk), or 1 to 5 parts to 100 of water directly to the diseased parts by mopping. Schnitzler and Kortüm likewise recommend it as a gargle in diphtheria. Applied in the same manner creolin is useful in tonsillitis. A 1-per-cent. solution has been found curative in thrush and aphthæ. The injection, two or three times a day, of 2 to 4 pints of a ½-per-cent. solution has yielded excellent results in dysentery. In this strength the intestinal mucous membrane was not irritated; no burning or abdominal pain was produced. The same injection is efficacious in serous diarrhœa, colitis and entero-colitis. In the summer diarrhœa of children and in cholera infantum the solution may be advantageously employed in half strength or less, according to the age of the patient. Given internally it is reported to have given good results in flatulence and to have succeeded in cases of tænia and oxyuris vermicularis. The offensive odor of cancer is removed by creolin. A 5- to 10-per-cent. creolin-oil is efficient in pediculosis and scabies, or prescribed thus:—

| | |
|---|---|
| ℞ Creolini, | fʒss. |
| Balsam. Peruviani, | fʒij. |
| Adipis, | ℥j. |

M. Sig.: Apply well over the surface. Use in scabies.

Dr. P. S. Abraham has used advantageously the following application in large and indurated patches of psoriasis:—

| | |
|---|---|
| ℞ Creolini, | ʒss–j. |
| Hydrarg. ammon., | gr. x–xx. |
| Sapon. mollis, | ʒiiss. |
| Vaselin, | q. s. ad ʒj. |

M.

A 1 to 1000 aqueous solution has been used in gonorrhœa. It has seemed much more beneficial in gonorrhœa of women than of men. A 1-per-cent. solution is a very efficacious injection in the cystitis of women. In diseases of women it can also be employed according to the following formulæ:—

℞ Creolini, . . . . . . . . . . . . . fʒj.
Ext. hydrastis Canadensis fl.. . . . . . . . f℥ss.
Glycerini, . . . . . . . . . . . . f℥iss.
M. Sig.: One or two teaspoonfuls in a pint of water, to be employed at one injection. Use in leucorrhœa and pruritus of the vagina.

℞ Creolini, . . . . . . . . . . . . . fʒj.
Boro-glyceridi (50 per cent.), . . . . . . . f℥v.
M. Sig.: Use as an injection, one to two teaspoonfuls in a pint of water, for uterine and vaginal diseases.

As a wash in puerperal septicæmia, and as an antiseptic vaginal injection before or after labor, a creolin solution is of value. Five or six drops to a pint of water have been successfully used in otorrhœa. In extensive burns and in bed-sores, Kortüm recommends a 5- to-1000 aqueous solution. A 1- or 2-per-cent. solution is an excellent deodorant and stimulant dressing to leg-ulcers. Rothe* has used creolin in the form of an ointment with marked success in the treatment of erysipelas, tinea versicolor, eczema, and in scabies. Obstinate cases of pustular eczema have been cured by the application of creolin water.

A 2-per-cent. solution is an admirable disinfectant to the hands of the surgeon. A creolin-soap is also made. The opacity of its watery solution renders creolin inferior to carbolic acid as an immersion fluid for instruments. Moreover, resinous particles are soon deposited upon the instruments, though this drawback has been overcome by the manufacture of vessels having a perforated false bottom upon which the instruments may rest. Gauze, bandages, and absorbent cotton may often be advantageously impregnated with a creolin solution. A 1- or 2-per-cent. ointment of creolin, and a powder composed of 2 parts of creolin to 100 of boric acid, will in many conditions be found serviceable. In the acute gastro-enteritis of children, Schwing has obtained satisfactory results from doses of 2 or 3 drops of creolin administered in some demulcent vehicle. The internal administration of creolin has, however, been followed in several instances by decided choleriform manifestations.

## CROCUS (U. S. P.).—Saffron.

**Dose,** gr. x–xx.

### *Preparation.*

*Tinctura Croci* (U. S. P.).—Tincture of Saffron (10 per cent.). *Dose,* fʒi–ij.

**Pharmacology.**—The stigmas of Crocus sativus (Irideæ) are official under the title of Crocus. They are obtained from cultivated plants in the south of Europe. Spanish saffron has a strong, peculiar odor, an aromatic, bitter taste, and imparts a yellow hue to the saliva when chewed. So-called American saffron is a different plant, the Carthamus tinctorius, or safflower, of which the flowers are used. Saffron of good quality, however, is cultivated in Pennsylvania.

**Therapy.**—Saffron is slightly aromatic and feebly anodyne and antispasmodic. A hot infusion called saffron-tea is made from the safflower and not from saffron; it is used in domestic practice to bring out the eruption in measles and scarlet fever and as a diaphoretic. In Europe the tincture of saffron is employed as an emmenagogue and given in flatulent dyspepsia and colic. Externally it has been used in bruises, rheumatic and neuralgic pains and in the form of ointment to hæmorrhoids. In this country its only use, as a rule, is that of a coloring agent.

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* *British Journal of Dermatology,* November, 1890.

### **CUBEBA** (U. S. P.).—**Cubeb.**

**Dose,** gr. xx–ʒij (of the recently powdered drug).

*Preparations.*

*Extractum Cubebæ Fluidum* (U. S. P.).—Fluid Extract of Cubeb. *Dose,* ♏x–xxx.
*Oleoresina Cubebæ* (U. S. P.).—Oleoresin of Cubeb. *Dose,* ♏v–xxx.
*Oleum Cubebæ* (U. S. P.).—Oil of Cubeb. *Dose,* ♏v–xij.
*Tinctura Cubebæ* (U. S. P.).—Tincture of Cubeb. *Dose,* f ʒ ss–ij.
*Trochisci Cubebæ* (U. S. P.).—Troches of Cubeb (♏ss oleoresin).

**Pharmacology.**—The unripe fruit of the Piper cubeba (Piperaceæ), a plant cultivated in Java, contains a volatile oil and an acrid resin; the latter composed of **Cubebin,** a tasteless, insoluble, neutral substance, and **cubebic acid,** with fat, gum, etc. **Cubebene,** a camphoraceous substance, can be separated from the volatile oil, leaving **Cubeben,** a liquid oil, behind. The medicinal activity of the drug consists principally in the volatile oil and cubebic acid, which are both present in the oleoresin.

**Physiological Action.**—The effects of cubeb are those of an aromatic stimulant to the stomach, improving the digestion in small doses and increasing appetite; deranging digestion in larger doses and acting as an irritant. Cubeb increases the force and frequency of the heart's action, stimulates the genital organs, and promotes menstruation. It is eliminated by the skin (frequently causing an urticarial or vesicular eruption). Cubeb may likewise produce, especially in young subjects, a bright red rash which disappears in the course of a few days after discontinuance of the drug and which may be followed by fine desquamation. It is also removed from the system by the bronchial mucous membrane (acting as an expectorant and antiseptic), but chiefly by the kidneys (increasing the quantity of urine and disinfecting the urinary passages). The addition of nitric acid to the urine of a person taking cubeb produces a precipitate which bears a resemblance to that of albumin.

**Therapy.**—The powder of cubeb is considered a good application in hay fever, chronic nasal catarrh, and follicular pharyngitis. In hay fever, if it does not increase the irritation, it may be useful. In asthma, or swollen "hypertrophies" in the nose, cubeb cigarettes are smoked with relief. Cubeb is also sometimes given internally in cases of chronic bronchitis accompanied by free secretion.

Cubeb is principally used in blennorrhœa, cystitis, and purulent affections of the genito-urinary tract. In gonorrhœa it may be given in all stages of the disease, acting best in the acute stage. Some patients, however, appear to be very susceptible to the effect of this drug, small doses causing digestive disturbance, irritability of the bladder, and bloody urine. A mixture of cubeb and alum is an efficacious, though nauseous, remedy in chronic gonorrhœa. It may be thus prescribed:—

| | |
|---|---|
| ℞ Pulv. aluminis, | ʒj. |
| Pulv. cubebæ, | ℥iv. |

M. Sig.: A tablespoonful three times a day.

By a combination of cubeb and copaiba the effect of each agent in gonorrhœa is increased:—

| | |
|---|---|
| ℞ Oleoresinæ cubebæ, | |
| Copaibæ, | āā fʒj. |
| Pulv. sacch. alb., | |
| Pulv. acaciæ, | āā ℥ss. |
| Aquæ menthæ piperitæ, | q. s. ad f℥iv. |

M. Sig.: Teaspoonful three times a day.

Functional irritability of the bladder, so common in women, is often relieved by cubeb. Cubeb is sometimes of service, also, in nocturnal incontinence of urine. In chronic catarrh of the lower bowel and in the interparoxysmal periods of pseudo-membranous enteretis, cubeb is likewise advantageous. By some writers it is esteemed of value in the treatment of hæmorrhoids.

Atonic dyspepsia may receive benefit from the temporary employment of small doses of cubeb, which are of service also in bronchorrhœa.

The troches of cubeb may be used in the treatment of sore throat and hoarseness, from two to five daily being allowed to slowly dissolve in the mouth.

## CUPRUM.—Copper.

### *Preparations.*

*Cupri Acetas.*—Copper Acetate. *Dose*, gr. $\frac{1}{10}$.

*Cupri Sulphas* (U. S. P.).—Copper Sulphate. *Dose*, gr. $\frac{1}{6}$ (gr. ij as an emetic).

*Caprum Ammoniatum.*—Ammoniated Copper. *Dose*, gr. $\frac{1}{6}$–j.

*Cupri Arsenis.*—Copper Arsenite. *Dose*, gr. $\frac{1}{40}$–j.

*Cuprum Aluminatum.*—Aluminated Copper. Lapis Divinus. External use.

*Ceratum Cupri Acetatis.*—Cerate of Copper Acetate. (Melt together yellow wax, 50 parts; Burgundy pitch, 25 parts; European turpentine, 15 parts; strain, incorporate thoroughly finely powdered acetate of copper, 5 parts; pour into moulds, to form cakes of about 1 centimetre thickness). Green cerate, for corns, warts, etc.

**Pharmacology.**—Copper has but one official salt—the sulphate—which is an irritating poison, although the metal is inert, because insoluble. Copper was formerly used very much in making cooking utensils for family use, but it was found that, unless kept very bright and clean, they would give rise to poisoning by the formation of verdigris, a basic copper acetate. Copper is sometimes added to pickles to make them of a brighter green color, a fraud which can be detected by placing a blade of a knife, or polished piece of steel, in the liquor; if it contain copper, there will be a deposit of metallic copper upon the iron in the course of a few minutes. It is held that the very small amount of copper that would be introduced into the system by eating such a pickle would be only a mere fraction of a grain, and not enough to cause symptoms. A far more dangerous source of poisoning is found in the wall-paper pigments containing copper arsenite, which is very poisonous. It is not only the green colors that are dangerous, but all vivid colors, such as scarlet, crimson, or lake. It is especially velvet or embossed papers that are likely to be loaded with pigment, and these should never be used for a dwelling-house unless first tested and found to be free from arsenic by the ordinary tests for that poison.

**Physiological Action.**—When locally applied, copper sulphate is an astringent or a caustic, according to the manner of application. Injected hypodermically, it causes coma and convulsions in cats, and death from respiratory failure; in overdose by the stomach it causes fatal gastro-enteritis. Copper in very small proportion exists normally in the blood, and in minute doses it exerts a tonic effect upon the organism. This is well shown in some skin diseases of a dry type, due to defective nutrition, and in incipient or threatened phthisis. The secretions along the gastro-intestinal tract are increased, as shown by the salivation, vomiting, and purging. It is a local and not a systemic emetic. Copper is eliminated by the liver, kidneys, salivary and intestinal glands. It may remain, like other metals, stored up for a considerable period within the liver.

When any of the salts of copper have been swallowed in overdose there are nausea, vomiting and retching, purging of blood and mucus, and rapid depression of bodily powers; and the latter may be the more prominent. In chronic poisoning, pharyngeal irritation, bronchial catarrh, colic, diarrhœa, or dysentery, salivation, anæmia, and emaciation occur. There is sometimes a green line upon the gums. Jaundice and fatty degeneration or atrophy of the liver ensue, and pulmonary congestion or consolidation may set in. The effects upon the nervous system are seen in headache, defective co-ordination, and weakness, with nervous vomiting. Toxic symptoms manifest themselves very soon after the metallic salt has been taken. The chemical antidote is potassium ferrocyanide followed by demulcents, eggs, milk, oil, etc., and the stomach should be irrigated with an alkaline solution, counter-irritation applied, and anodynes given. The incompatibles of copper are metallic sulphides, alkalies and alkaline earths, iodides and vegetable infusions containing tannin.

**Therapy.**—Copper sulphate, in solid stick, is used as a superficial caustic in indolent ulcers, exuberant granulations, and in syphilitic and other sores in the mouth and throat. It may also be lightly applied in cases of granular lids, or a solution (gr. i-ij to f℥j) instilled into the eye in subacute conjunctivitis, but for this the acetate is preferred. A crystal of copper sulphate is likewise serviceable as a hæmostatic in checking hæmorrhages from slight wounds, leech-bites, or the surface of irritable ulcers. A solution of this salt is employed locally with benefit in order to suppress excessive and chronic discharges. In the strength of from 10 to 20 grains to the ounce of menstruum it may be thrown into the bowel for the relief of chronic diarrhœa or dysentery. The same method is beneficial in acute diarrhœa of severe form. From 5 to 10 grains of the sulphate dissolved in an ounce of glycerin is one of the preparations which may be recommended for use in pseudo-membranous enteritis. The fluid should be injected into the bowel during the inter-paroxysmal period for the purpose of modifying the condition of the mucous membrane. A weak, aqueous solution of copper sulphate is an excellent stimulant dressing to chancres and chancroids, and forms a good injection in leucorrhœa, vaginitis, and gleet.

Copper sulphate, made into the form of a pencil, has been employed in the treatment of endometritis, introduced within the cervical canal and held in place by a tampon of iodoform gauze. Although praised by some writers, Boursier asserts that it may give rise to violent uterine colic, metrorrhagia, a profuse discharge and vomiting. The application is likewise capable of causing a loss of substance of the mucous membrane and may be followed by atresia. Pencils or suppositories containing copper sulphate should not be left too long in position. Dr. Tarnier esteems a 5-per-cent. solution of copper sulphate a valuable disinfectant for washing out the uterus and vagina after delivery.

This salt enters into the composition of injections for gonorrhœa, and may be advantageously combined as follows:—

| | | |
|---|---|---|
| ℞ Cupri sulphatis, | | gr. xij. |
| Zinci sulphatis, | | |
| Plumbi acetatis, | āā | gr. xxiv. |
| Ext. krameriæ fl., | | f ʒ j. |
| Vini opii, | | f ʒ ij. |
| Aquæ rosæ, | q. s. ad | f ℥ vj.—M. |

| | |
|---|---|
| ℞ Cupri sulphatis, | gr. v. |
| Ext. geranii fl., | f ℥ ss. |
| Glycerini, | f ℥ j. |
| Aquæ rosæ, | f ℥ iiss.—M. |

The oleate of copper is an admirable astringent, antiseptic, and antiparasitic preparation, especially valuable in the various forms of tinea trichophytosis.

The sulphate is sometimes effective as a local stimulant in an indolent impetigo, and a weak solution is efficacious in ulcerative stomatitis and thrush. An ounce in the sulphate in a pint of water is a solution which has been found very efficacous in the treatment of scabies. Other cutaneous affections, as psoriasis, chronic eczema, sycosis, favus, acne, hyperidrosis, and bromidrosis, are ameliorated by the topical application of copper sulphate or acetate in the form of an ointment or a lotion, or the oleate made into a 10- or 20-per-cent. ointment. A gargle containing 5 grains of copper sulphate to the ounce of water does good in relaxed sore throat. The sulphate, or other salts of copper, may be employed externally in the following formulæ:—

| | |
|---|---|
| ℞ Cupri sulphatis, | gr. v. |
| Aquæ hamamelidis dest., | f ℥ v. |

M. For a gargle, or apply over the surface for hyperidrosis or bromidrosis.

| | |
|---|---|
| ℞ Cupri sulphatis, | gr. x. vel xxx. |
| Acidi borici, | ʒ j. |
| Creosoti, | ♏x. |
| Ungt. aquæ rosæ, | ℥ j. |

M. Useful in sycosis and parasitic diseases of the skin.

In summer diarrhœa and cholera infantum copper sulphate is of undoubted efficacy. It is likewise a valuable remedy in the diarrhœa and dysentery of adults. Diarrhœa, whether acute or chronic, will often yield to copper sulphate. It has been found of service in restraining tuberculous diarrhœa, and has been highly praised by some writers for its virtue in the diarrhœa of typhoid fever. Copper sulphate has also been administered with good results in cholera. Dr. Phillips has often known tænia to be dislodged and passed under the use of small doses of copper sulphate. He begins with about $\frac{1}{6}$ grain and gives it every morning upon an empty stomach, gradually increasing the dose until 3 to 5 grains can be taken without vomiting.

The same salt is useful in bronchorrhœa. A small dose of the sulphate, $\frac{1}{20}$ grain three times a day, will sometimes allay the vomiting of pregnancy. Small doses of the same salt, given with or after meals, improve nutrition, and have been recommended as of service in ecthyma, scrofula and tuberculosis.

Luton makes use in tuberculosis of a "cupric serum," made by dissolving 3 grains of copper acetate in three ounces of his "artificial serum." Of this fluid a drachm and a quarter is the average dose for an adult.

Dr. A. F. Price, U. S. N., recommends the sulphate as a remedy in syphilis. He states that it is of particular efficacy in syphilitic adenopathies and, although slow in removing syphilides of the secondary stage, it prevents the development of mucous patches and throat symptoms. He gives it in an average dose of $\frac{1}{30}$ grain thrice daily and recommends that its use should be omitted one day in each week.

Its action as a prompt emetic is best utilized in phosphorous poisoning, where it is also antidotal. In other cases the zinc salts, or mercuric subsulphate, are better, because safer. Copper has a very decided action upon the nervous system, and the ammoniated copper particularly is used and highly praised for its effects in chronic neuroses, epilepsy, chorea, hysteria, and in the treatment of facial neuralgia. It is claimed that the administration of $\frac{1}{12}$ grain of copper sulphate every night at bed-time will relieve the cramping pain in the legs from which pregnant women sometimes suffer.

In chorea, especially when connected with the presence of tænia or other worms and in epileptiform convulsions dependent upon intestinal worms, Phillips has witnessed good results from the administration of the sulphate. In asthma, also, he has observed benefit from its use.

Dr. Boardman Reed, of Atlantic City, speaks favorably of the use of copper arsenite in minute doses as an antispasmodic in cases of after pains.* He gives $\frac{1}{1000}$ grain every half hour with complete relief. It has also been highly extolled in the treatment of diarrhœa of infancy, where it may exert an antiseptic action upon the contents of the intestinal tract, when given in small and frequently repeated doses, as first suggested by Dr. Reed. A solution prepared in this manner is often of marked benefit in after-pains, diarrhœa, and in cholera morbus.

℞ Cupri arsenitis, . . . . . . . . . . gr ss.
Aquæ camphoræ,
Aquæ cinnamomi, . . . . . . . . . āā f℥iv.

M. Sig.: From one-half to a teaspoonful every half hour or hour until relieved.

Copper arsenite, in doses of $\frac{1}{50}$ to $\frac{1}{25}$ grain after each meal, is said to be of value in the treatment of functional anæmia. In pronounced chlorosis Liegeois has obtained good results from copper, administered in the following form :—

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* *Times and Register*, December 6, 1890.

℞ Cupri acetat. neutralis, . . . . . . . gr. $\frac{1}{6}$.
Sodii phosphat. crystall., . . . . . . . gr. $\frac{3}{4}$.
Pulv. glycyrrh.,
Glycerini, . . . . . . . . . āā q. s.
M. ft. pil. no. j. Mitt. tales no. xxx.

One or two pills were given twice daily before meals. The drug could be taken for three months uninterruptedly without occasioning any derangement of the digestive functions. If the chlorosis was accompanied by amenorrhea, menorrhagia or leucorrhœa, $\frac{3}{4}$ to $1\frac{1}{2}$ grain of newly prepared powdered ergot was added to each pill.

The internal use of copper sulphate is recommended by some authorities in laryngeal croup, or diphtheria, small doses being given every quarter or half an hour until vomiting is produced, when the dose is reduced and administered at longer intervals.

Aluminated copper is used externally as a stimulant and astringent to ulcers, and as a collyrium for inflammation of the conjunctiva. It is a powder compound of equal parts (30 parts) of copper sulphate, alum, and potassium nitrate, with a small proportion (2 parts) of camphor.

Dr. St. Germain recommends the hypodermic injection of extemporaneously prepared phosphate of copper as of benefit in case of glandular enlargements among children. Some local and general reaction is produced, but this effect soon subsides and is followed by amendment. The salt is obtained by mixing solutions of sodium phosphate and copper acetate, and the injection is generally made behind the great trochanter once in two weeks. Dr. F. Schmidt asserts that copper oxide possesses tæniacidal properties. He gives it in gradually increasing doses for two weeks, when a dose of castor-oil is administered.

## CURARE.—Curare, Woorara, or Arrow-Poison.

**Dose,** gr. $\frac{1}{20}$ to $\frac{1}{2}$, hypodermically administered.

**Pharmacology.**—A blackish-brown brittle substance, of unknown composition, made by natives of South America as an arrow-poison, and probably contains Paulinia curare and other plants of the Strychnos family, or Cocculus. An extremely poisonous alkaloid, **Curarine,** has been obtained from curare.

**Physiological Action.**—No effect follows the introduction of this drug into the stomach, as absorption is slow, and it is very rapidly thrown out of the circulation by the kidneys, and hence it is unlikely that it is a poison allied to strychnine or cocculus, but it seems more like a virus of animal origin.

It must be injected hypodermically in order to produce its characteristic symptoms, which are: paralysis of the voluntary muscles by loss of power of the end organs of the motor nerves; subsequently, the brain-centres are affected, if life be sustained by artificial respiration, death being brought about by respiratory failure. Curarine is without effect upon the sensory nerves. The blood-pressure is lowered and the heart is weakened. Sugar appears in the urine. The antidotes are strychnine and atropine, diffusible stimulants, artificial respiration, warmth and friction to the extremities, the use of the catheter, etc.

The physiological action of curare and curarine has been studied by Joseph Tillie, who finds that the alkaloid produces a tetanizing effect upon the spinal cord. It paralyzes the vaso-motor nerves and therefore causes a diminution of blood-pressure. Small doses of curarine caused in a rabbit the occurrence of albumin, blood and blood-pigment in the urine. Professor Reichert has investigated the influence of curare upon heat production and heat dissipation. A variable effect was observed, heat dissipation being always increased while production was either increased or diminished.

**Therapy.**—The use of curare in practical medicine at present is limited to the treatment of hydrophobia, two cases having been reported in which the symptoms disappeared under its use and the patient recovered. The drug is very variable in composition and effects, but $\frac{1}{20}$ grain may be given hypodermically and repeated according to the symptoms. Trial has been made of curare in other affections characterized by spasm, as chorea, tic douloureux, epilepsy, and tetanus; and although a certain measure of success has attended its employment, yet different samples vary so greatly in composition that it has been found of less practical value than would be inferred from its powerful physiological action.

### CURCAS.—Purging Nut.

**Pharmacology and Therapy.**—The seeds of Curcas purgans (Euphorbiaceæ), a shrub which grows in the West Indies, South America and other tropical countries, contain a colorless or light yellow fixed oil, devoid of odor and of a pleasant, almond-like taste. The oil is a local irritant, and has been used diluted as a topical application in rheumatism. Taken internally it is an active purgative in the dose of 10 or 12 drops, and has been used to relieve constipation, lessen dropsical effusions and to expel worms.

Poisoning has sometimes occurred in persons who had eaten curcas-seeds, the symptoms being vomiting, catharsis and prostration.

### CUSSO (U. S. P.).—Kousso, Brayera.

*Preparations.*

*Extractum Cusso Fluidum* (U. S. P.).—Fluid Extract of Kousso. *Dose*, ♏xx–fʒij.

*Infusum Cusso.*—Infusion of Kousso (6 per cent.). *Dose*, f℥iv–viij.

*Kosin.*—The active principle. *Dose*, gr. v–xx.

**Pharmacology and Therapy.**—Brayera is the female inflorescence of Hagenia abyssinica (Rosaceæ), a tree of Abyssinia. Kosin is a crystalline substance of acid reaction, combined with tannic acid, a volatile oil, and a resinous substance (kousseïn), which is an impure kosin. In large doses, brayera is a gastro-intestinal irritant, and is liable to cause vomiting. It is usually administered in infusion for the expulsion of tape-worm. It should be followed by a purgative in about two hours, castor-oil being ordinarily used. Kosin, in 20-grain doses, is said to be less liable to cause nausea than the fluid preparations. Brayera should not be given during pregnancy, for fear of causing abortion. Kousseïn is an amorphous, yellowish-brown powder, has a bitter taste, is soluble in alcohol, ether and chloroform and but slightly soluble in water. It has been given as an anthelmintic in doses from 15 to 60 grains.

## CYDONIUM.—Cydonium, Quince-Seed.

*Preparation.*

*Mucilago Cydonii.*—Mucilage of Cydonium (2 per cent.).

**Pharmacology and Therapy.**—The seeds of Cydonium vulgaris (Rosaceæ) were formerly official in order to provide the mucilage of Cydonium, these seeds containing about 20 per cent. of vegetable mucilage. It is best made with rose-water. It is used locally in inflammation of the skin, or conjunctivitis, or it may be used internally, *ad libitum*, in disorders of the alimentary canal requiring a demulcent.

## CYNOGLOSSUM.—Cynoglossum.

**Pharmacology and Therapy.**—The root of the Cynoglossum officinale (Boragineæ), an indigenous plant, is of interest, because it contains **Cynoglossine,** a brown, amorphous substance, soluble in water and alcohol, having an alkaline reaction, which Buchheim, its discoverer, found to possess narcotic powers. Its physiological action is said to be analogous to that of curare.

## CYPRIPEDIUM (U. S. P.).—Cypripedium, Ladies' Slipper.

**Dose,** gr. xv–xxx.

*Preparations.*

*Extractum Cypripedii Fluidum* (U. S. P.).—Fluid Extract of Cypripedium, *Dose,* ♏x–xx.

*Extractum Cypripedii.*—Extract of Cypripedium. *Dose,* gr. i–v.

**Pharmacology.**—The rhizome and roots of Cypripedium pubescens and of Cypripedium parviflorum (Orchideæ). The roots have a heavy, disagreeable odor, and contain a volatile oil, a volatile acid, resins, and tannin. **Cypripedin** is an impure alcoholic extract (dose, gr. ii–iij).

**Physiological Action and Therapy.**—In its effects it resembles valerian as an antispasmodic, tonic, stimulant, and diaphoretic. It is given in neurasthenia, nervous hyperæsthesia, neuralgia, nervous headache, hypochondria, insomnia, and epilepsy.

## DAMIANA.—Damiana.

**Dose,** ℥ss, in infusion or decoction.

*Preparations.*

*Extractum Damianæ.*—Extract of Damiana. *Dose,* gr. v–xv.

*Extractum Damianæ Fluidum.*—Fluid Extract of Damiana. *Dose,* fʒss–iv.

*Glycerol Damianæ, Phosphori et Nucis Vomicæ* (containing in each fluidounce, damiana, ʒj; phosphorus, gr. $\frac{1}{25}$; nux vomicæ, gr. iv). *Dose,* fʒj.

*Elixir Damianæ.*—Elixir of Damiana. *Dose,* fʒii–℥j.

**Pharmacology.**—A small, mint-like plant (Turnera diffusa, microphylla, or aphrodisiaca; natural order, Turneraceæ), bearing yellowish-white fragrant flowers, growing near the western coast of Mexico. Other plants have been sold under the name of damiana, and it is probable that some of the uncertainty of result has been due to the substitution of some other drug for the Turnera. The leaves are the part used; they contain a volatile oil, a resin, and other constituents.

**Physiological Action.**—Upon the sexual appetite and function, damiana undoubtedly exerts some stimulant effects; but it is also a general tonic. Damiana is thought to have a reconstituent effect upon the spinal and medullary centres. Upon the digestive organs it acts as a carminative, and in larger doses as a cathartic laxative. It is slighty cholagogue, and is also a stimulating diuretic.

A case of poisoning from damiana has been reported, the symptoms being closely analogous to those produced by strychnine. Recovery took place in consequence of the treatment usual in intoxication from strychnine.

**Therapy.**—In nervous dyspepsia, neuralgia, cerebral exhaustion, neurasthenia, or want of tone in the nervous system, also in sick-headache or migraine, damiana has been found to be useful. It has been of service in cases of paraplegia and hemiplegia and atony persisting after prolonged illness. It is especially employed, however, in treating functional impotence from any cause, combined with hygienic and other treatment, especially nux vomica, iron and phosphorus.

Damiana relieves irritability of the bladder and urethra, so often associated with prostatorrhœa or spermatorrhœa. Softness and tenderness of the testes as a result of sexual excess have been benefited by the administration of this drug. In cases of abnormal sexual appetite it has manifested a sedative influence.

**DIGITALIS** (U. S. P.).—**Digitalis, Foxglove.**

**Dose,** gr. ss–ij.

*Preparations.*

*Extractum Digitalis* (U. S. P.).—Extract of Digitalis. *Dose*, gr. $\frac{1}{4}$–$\frac{1}{2}$.

*Extractum Digitalis Fluidum* (U. S. P.).—Fluid Extract of Digitalis. *Dose*, ♏ss–ij.

*Infusum Digitalis* (U. S. P.).—Infusion of Digitalis ($1\frac{1}{2}$ per cent.). *Dose*, fʒi–iv.

*Tinctura Digitalis* (U. S. P.).—Tincture of Digitalis (15 per cent.). *Dose*, ♏x–xxx.

*Digitalinum.*—A mixture of several active principles. *Dose*, gr. $\frac{1}{60}$–$\frac{1}{30}$.

**Pharmacology.**—The leaves of Digitalis purpurea (Scrophularineæ), gathered from plants of the second year's growth. **Digitalin,** which was formerly official, and considered as the active principle, is a mixture of several, the most active of which is **Digitoxin**, which, with **Digitalin** and **Digitalein,** represents the cardiac, stimulating action of the drug, while **Digitonin** appears to exert a contrary effect, acting like saponin (Schmiedeberg).

Digitonin is, according to H. Kiliani, a glucoside which, when heated with dilute hydrochloric acid, splits up into digitogenin, dextrose and galactose. By oxidation with chromic acid digitogenin yields digitogenic acid.

A fifth substance, **Digitin,** seems to be devoid of physiological and therapeutical actions. These are all non-nitrogenous, and are glucosides. No alkaloid is present in digitalis. It also contains tannin, volatile oil, fatty matter, red coloring matter, chlorophyll, albumin, starch, sugar, gum, lignin, and salts. Two acids have been discovered by M. Morine,—digitalic and antirrhinic. The varying solubility of the active principles in the vehicles used explains the difference of therapeutical effect. Digitalin is insoluble in water, but soluble in alcohol; digitoxin is insoluble in water, sparingly soluble in alcohol; digitalein is soluble in ether; digitonin, soluble in water, sparingly in alcohol. The ordinary commercial digitaline is principally digitalin; Nativelle's digitaline is principally digitoxine with a little digitalin; it is a very active preparation. The tincture of digitalis and alcoholic fluid extract contain both digitalin and digitoxin; the infusion contains principally digitonin and very little digitoxin. In order to get the full physiological effect it is necessary to use the carefully-selected leaves, according to the pharmacopœial requirements.

**Physiological Action.**—Digitalis is readily absorbed by the skin, and is thought to have some local sedative effects when used on spongiopiline, or in a cataplasm. Although it has a bitter taste, digitalis has no tonic action upon the stomach, but, on the contrary, often disorders the digestion, and may cause vomiting or diarrhœa when too long continued. Its active principles readily diffuse into the blood, reducing the rate of the heart's action by lengthening the period of rest or asystole, thus allowing its cavities to receive more blood. At the same time that it increases the inhibition it stimulates the motor ganglia and increases the force of the contraction. Moreover, digitalin causes the contraction of the arterioles throughout the body, and thus combines its effects with the preceding in order to raise arterial tension. Germain Sée has ascertained that exhausting diseases occasion flaccidity of the cardiac muscle, with consequent dilatation of the organ. In such condition digitaline diminishes the volume of the heart, but acts especially upon the fibres of the right cavities. The temperature is reduced in pyretic conditions, though not in health. The slowness of its action (requiring from thirty-six to forty-eight hours) in reducing fever and its likelihood of disturbing the stomach tend to preclude its use for this purpose in acute fevers. Its action upon the circulation may be summed up as being that of a vascular stimulant, raising arterial pressure, lowering abnormal temperature, and steadying the heart. Upon the brain and spinal cord it produces little direct effect. The reflex action of the spinal cord is reduced by large doses, and there is stimulation of the pneumogastric and vaso-motor nerves. It is liable to cause headache, delirium, and vertigo, possibly from disturbance of the cerebral circulation, the effects of the volatile oil, or from sick-stomach. Syncope may be due to heart-failure from overstimulation after the drug has been used for some time, especially if the patient suddenly sits up in bed or assumes an erect posture. It stimulates the vaso-motor ganglia in the medulla. Large doses excite Setschenow's centre and produce muscular paralysis; the peripheral nerves, both motor and sensory, being also paralyzed. Respiration becomes feeble and more rapid, coma and convulsions follow, and death is attended by systolic arrest of the heart's action, from its tetanizing effect upon the cardiac muscle or from exhaustion of motor ganglia. The general action upon muscular tissue is to lessen contractility and cause lassitude and want of vigor. The venereal functions are depressed. The effect upon the kidneys is peculiar. The increase of arterial tension in the glomeruli accompanying the general effect on the circulation is assisted by a special action, by which the renal arteries are diluted, thus acting as a true diuretic; while the excretion of urea is at first increased, it subsequently diminishes. The greatest effect as a diuretic is obtained in diseased conditions, accompanied by œdema and low arterial pressure. Digitalis also has some effect upon the muscular tissue of the uterus, stimulating it to contraction.

Aconite and digitalis are antagonistic. The former slows the heart by expanding the peripheral vessels and lowering blood-pressure; the latter reduces the number of contractions by stimulating the inhibitory fibres in the pneumogastric nerve, and tightens up the arterioles, thus causing increased blood-pressure. Aconite directly lowers the action of the cardiac motor ganglia, and is a cardiac poison; digitalis indirectly exhausts the motor ganglia by permitting overaction and exhaustion; in the former, the heart is found, after death, in a condition of dilatation or asystole; in the latter, it is in a state of contraction or systole. The action of aconite upon the heart is rapid; the action of digitalis is gradual and slow; so that the latter is not a practical antidote for the other. An erythematous, papular or erysipelatous rash will occasionally follow either the internal or external use of digitalis.

**Poisoning.**—When digitalis or digitalin has been taken by mistake in an overdose, tannin, or infusion of tea or coffee, should be given at once, the stomach washed out and stimulants given. Saponin is the physiological antagonist, according to Bartholow. The compound tincture of cinchona might be useful, as it contains tannin, alcohol, and quinine. Ferrous sulphate or tincture of ferric chloride should also prove useful. The patient should be kept in a recumbent posture; hot drinks and hot-water bottles should be around him and spirit of ammonia inhaled. As long as the functions of the kidneys are maintained, it has been observed that symptoms of so-called "accumulation" are not apt to arise. As already explained, these are attributed to overstimulation and exhaustion of the heart, but possibly there may be an uræmic element in some cases which would require appropriate treatment.

Poisoning from digitalis seldom has a fatal termination, and the minimum dose of digitalis or digitaline is not at present known.

**Therapy.**—Locally, digitalis is employed in joint inflammation, combined with moisture and heat, acting as a sedative and possibly reducing the calibre of the vessels. Part of it is absorbed and carried to the kidneys, where it produces a diuretic effect, especially when the hot application is made over the loins. A half ounce or more of tincture of digitalis may be sprinkled upon spongio-piline, or flannel wrung out of hot water, and applied to the lumbar region; or a cataplasm containing a drachm or two of the leaves, applied in cases of dysuria or suppression of urine. Bronchial congestion due to heart disease may also be relieved by the local application of digitalis.

Dr. Pilatte has found the local application of digitalis serviceable in chilblains. The formula of which he makes use is:—

| | | |
|---|---|---|
| ℞ Tinct. digitalis, | | fʒiss. |
| Thymol. cryst., | | gr. xlv. |
| Alcohol (70°), | | |
| Glycerin, | āā | f℥ivss. |

**M.** Sig.: Apply with friction.

Internally, it is chiefly prescribed as a heart-tonic in all cases of failure of circulation due to the feebleness of the heart's action. It should not be used in valvular disease as long as compensating hypertrophy is keeping up the work of the heart; but when this fails and dilatation is commencing, digitalis will not only slow and steady the heart, but improve the nutrition of the heart-walls by increasing the pressure in the coronary arteries and allowing them a longer time in which to be filled. In the absence of dropsy, and when the patient is passing an abundance of urine, digitalis is seldom demanded. In mitral stenosis, digitalis is to be used in order to allow the left auricle a longer time to empty itself into the ventricle; also, in tricuspid regurgitation with dilated right heart. It is not to be used in aortic stenosis, as a rule, although exceptional circumstances may require its use for a time, to regulate the rhythm of the heart, or to relieve dropsy. On account of the opposing action of the different principles contained in digitalis, Lander Brunton counsels that when, in disease of the heart, there is excessive constriction of the blood-vessels, digitalis should be given in combination with nitrous ether.

Cardiac dyspnœa or cardiac asthma, due to engorgement of the pulmonary circulation, is usually relieved by digitalis; and functional weakness, with irritable heart or low arterial tension, with migraine, or delirium tremens is very promptly benefited by it. Dr. Jules Comby writes that digitalis is beneficial in congenital maladies of the heart, with or without cyanosis, by strengthening the cardiac contractions, which are almost always insufficient, and by promoting diuresis. He does not, however, regard the drug as serviceable in the case of infants or young children attacked by nervous palpitations.

Large doses (f℥ss or more of the tincture) have been given in mania a potu and acute mania, with success. Isambert records the case of a maniacal child, fourteen years of age, in whom the delirium yielded to the administration of 30 drops of the tincture of digitalis. It is claimed by Gowers that digitalis, associated with belladonna, promotes the efficacy of the bromides in epilepsy.

It is a useful remedy in hæmorrhages, as in menorrhagia or hæmoptysis, and in the first stage of pneumonia. Digitalis is of particular advantage in the metrorrhagia or menorrhagia of plethoric individuals, or when dependent upon mitral disease. Post-partum hæmorrhage may likewise be restrained by the use of digitalis, which may here be appropriately combined with ergot. This remedy is of service in controlling epistaxis, and is a valuable adjunct to the tincture of iron in purpura hæmorrhagica. In the treatment of hæmorrhages, digitalis is usefully prescribed in combination, as—

| | | | |
|---|---|---|---|
| ℞ | Tr. digitalis, | | fʒiss. |
| | Tr. catechu, | | f℥j. |
| | Extr. ergotæ fl., | q. s. ad | f℥ij. |
| M. | Sig.: A dessertspoonful every hour or two. | | |

The infusion, however, is usually the most efficient preparation in hæmorrhage:—

| | |
|---|---|
| ℞ Plumbi acetatis, | gr. xl. |
| Morphinæ acetat., | gr. j. |
| Infus. digitalis, | f℥iv. |

M. et ft. sol.
Sig.: Tablespoonful every three hours.

Digitalis may also be prescribed for hæmorrhage in phthisis and in the first stage of pneumonia, thus:—

| | |
|---|---|
| ℞ Extracti digitalis, | gr. iij. |
| Pulveris ipecacuanhæ comp., | gr. xxiv. |

M. et ft. pil. no. xij.
Sig.: A pill every two or three hours.

In persistent diarrhœa complicating fever of a remittent type, Mr. Harold Henley has obtained good results from a combination of digitalis and strychnine given in spirit of chloroform and water.

In exophthalmic goitre and in congestive headaches, it sometimes succeeds remarkably in controlling the symptoms of disease. In the treatment of exophthalmic goitre Rockwell values a combination of digitalis or strophanthus with iron, ergot and zinc bromide.

Besides the special action above referred to, as a cardiac tonic or current regulator to the circulation, digitalis is the chief reliance in dropsy and serous effusions, owing to diuretic action. In acute renal dropsy the best effects are obtained by combination with calomel or other mercurial, and with squill, as in the famous Guy's pills:—

| | |
|---|---|
| ℞ Pulv. digitalis, | gr. ss. |
| Pulv. scillæ, | gr. iss. |
| Mass. hydrargyri, | gr. iij. |

M. et ft. pil.
Sig.: Take one or two at bed-time.

In cases of œdema due to Bright's disease, with scanty albuminous urine, the following are useful:—

| | |
|---|---|
| ℞ Potass. acetat., | ʒvj gr. xl. |
| Spiritus juniperi, | f℥iss. |
| Inf. digitalis, | q. s. ad f℥v. |

M. Sig.: A dessertspoonful every three hours.

| | |
|---|---|
| ℞ Infus. digitalis, | |
| Infus. scoparii, | |
| Infus. buchu, | āā f℥ij. |

M. Sig.: A dessertspoonful every three hours.

| | |
|---|---|
| ℞ Infus. digitalis, | |
| Infus. taraxaci, | |
| Spiritus ætheris nitrosi, | āā f℥ij. |

M. Sig.: A dessertspoonful every three hours.

Digitalis is of service in promoting absorption in pleurisy and hydrothorax. In the bronchitis and broncho-pneumonia of childhood it is beneficial. Dr. Broadbent observes that as digitalis increases the elimination of fluids and caffeine that of solids, the two agents should be combined in order to obtain the same effect as that produced by a large single dose of digitalis.

In menorrhagia, hæmoptysis, and in the hæmorrhagic diathesis, the tincture of digitalis is usually given in doses of 20 to 30 minims. The same doses may be given in cases of surgical shock or syncope. When the patient is exsanguined the remedy should be administered by hypodermic injection.

Spermatorrhœa with nocturnal emissions is benefited by digitalis in combination with ergot or with potassium bromide, according to circumstances. In this country it is not used for its antipyretic effect, although in Germany it has been given in the hyperpyrexia of rheumatism and scarlet fever. The infusion of digitalis is employed in the treatment of scarlatina, especially when the urine becomes scanty. The following combinations are very serviceable in the latter condition:—

℞ Inf. digitalis,
Spiritus ætheris nitrosi, . . . . . . āā f℥ss.
Potassi bitartratis, . . . . . . . . ʒif.
M. Sig.: A teaspoonful in water every three or four hours.

℞ Inf. digitalis,
Misturæ potassii citratis, . . . . . . āā f℥ij.
M. Sig.: A teaspoonful every two or three hours.

Digitalis should be given with great care, if at all, to persons with fatty degeneration of the heart and dilatation. It should not be given in pericarditis, although passive pericardial effusion may be removed without much danger. In simple hypertrophy or compensating hypertrophy, or conditions of high arterial tension or vascular excitement, it should rarely, if ever, be given. In any disease accompanied by changes in the heart-muscle or atheroma of the blood-vessels, digitalis should not be prescribed except for a temporary emergency. In dilatation of the heart, however, this remedy serves an excellent purpose. In typhoid fever, digitalis is liable to increase the diarrhœa and cause vomiting. In gastritis or acute nephritis, it would also prove injurious. In fibroid lung, digitalis lessens the cough, steadies the heart, and reduces œdema. It has been successfully employed in erysipelas. Digitalin should not be prescribed on account of the uncertainty of its action, the smallness of the dose of the leaves rendering it unnecessary.

Digitalis is the physiological antidote to muscarine and to aconite, but requires the aid of diffusible stimulants on account of its slowness of action, when treating cases of poisoning by these agents. It may be administered hypodermically in such cases in combination with whisky, and in surgical shock as recommended by Dr. Thomas G. Morton, of the Pennsylvania Hospital.

Masius and Van Aubel have used digitoxin with success to fulfill the indications of digitaline. They administered it in the dose of $\frac{1}{64}$ to $\frac{1}{48}$ grain and observed no ill effects upon the digestive functions. Its action is said to be prompt and decided and its effect upon the circulation is manifested within twelve or twenty-four hours. The influence of the remedy usually persists for eight to ten days. In pneumonia it reduces temperature within twenty-four to forty-eight hours. Digitoxin relieves the cyanosis and dyspnœa of cardiac affections, restores force and regularity to the pulse and occasions marked diuresis. It was found useful, likewise, in typhoid fever.

### DIOSCOREA VILLOSA.*—Wild Yam.

*Preparations.*

*Decoctum Dioscoreæ.*—Decoction of Dioscorea. *Dose,* f℥i–iv.
*Tinctura Dioscoreæ.*—Tincture of Dioscorea. *Dose,* ♏x–xj.
*Extractum Dioscoreæ Fluidum.*—Fluid Extract of Dioscorea. *Dose,* ♏v–xxx.

**Pharmacology.**—Dioscorea villosa (Dioscoreaceæ), wild yam or colic root, grows abundantly in our Southern States, but less plentifully in the Northern and Western States. The part made use of is the root. This is without odor when intact, but when bruised develops a slightly woody smell. The taste is somewhat pungent and sweetish-bitter. The powdered root is yellowish-gray in color, is soluble both in water and alcohol.

The root contains an active principle called **Dioscorein,** to which it chiefly owes its medicinal virtues. The physiological action of the drug has never been systematically studied.

**Therapy.**—Wild yam possesses diaphoretic and expectorant properties, but derives its principal value from its effect upon the hepatic functions. In large doses it is emetic. It is of especial service in the treatment of gall-stone. It quickly relieves pain and spasm, and, provided the calculus or calculi are not of extreme size, leads to their prompt expulsion. After the concretions have passed into the bowel this remedy is of service in reducing the congestion or inflammation which they have caused.

A yellowish discoloration of the skin and conjunctiva, joined with colicky pain and nausea, suggests the employment of dioscorea. Hepatic indigestion, with its train of evil consequences, is effectually relieved by the fluid extract in 15-drop doses before meals. The same preparation effects a marked improvement and gradual cure in chronic congestion of the liver.

In chronic malaria this agent is of decided advantage, and may be combined with arsenic, quinine, or nux vomica, as follows:—

| | |
|---|---|
| ℞ Liq. potass. arsenit., | fʒj. |
| Tinct. dioscoreæ villosæ, | f℥ss. |
| Tinct. cardamomi comp., | f℥iiss. |

M. A teaspoonful in water after meals.

In chronic gastritis, the result of alcoholic excess, wild yam is very serviceable and may be prescribed thus:—

| | |
|---|---|
| ℞ Tinct. belladonnæ, | ♏xxiv. |
| Tinct. nucis vomicæ, | fʒj. |
| Tinct. dioscoreæ villosæ, | f℥ss. |
| Syrupi zingiberis, | f℥iiss. |

M. Teaspoonful in water every fourth hour.

The progress of cirrhosis of the liver seems to be delayed by the administration of wild yam, which is at least as efficient in this disease as the mercuric chloride. Furthermore, the addition of dioscorea increases the analgesic effect of morphine in hepatic carcinoma.

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* See paper by the author, in *Journal of the American Medical Association,* September 21, 1889.

**DITA.—Dita-Bark.**

**Dose,** ʒi–iv, best given in the form of a fluid extract.

Dita-bark (Apocynaceæ) is from the East Indian Archipelago. It contains two bitter alkaloids, **Ditain** and **Ditamine,** has been used as an antiperiodic in treatment of ague, and is said to be of value in dysentery.

**DRACONTIUM.—Dracontium, Skunk-Cabbage.**

**Dose,** gr. x–ʒj.

**Pharmacology.**—The root of Dracontium fœtidum (Araceæ), a small plant of North America, has acid properties, and, when fresh, a very disagreeable smell, which warrants its common name. Besides this volatile principle the drug contains a resin, tannin, etc.

**Therapy.**—It is regarded as an antispasmodic, and has been used in chorea and hysteria, asthma, and chronic catarrh, using the recently dried root or a good fluid extract ($\frac{2}{3}$ alcoholic).

**DROSERA.—Drosera, Sundew.**

**Pharmacology.**—The Drosera rotundifolia (Droseraceæ), growing in Europe and North America, has a very limited use in medicine. The whole plant is used, and a recent infusion or fluid extract is the best method in which to administer it. It contains a resin, a red coloring matter, and, according to G. Stein, citric acid.

**Physiological Action.**—Drosera is irritating to the skin, and the juice is used as an application for corns or warts. Internally, it is expectorant.

**Therapy.**—It is used in chronic bronchial catarrh, and has some reputation in the treatment of phthisis. In spasmodic affections of the chest, whooping-cough, and paroxysmal asthma it is said to be serviceable. Three or four ounces of the expressed juice have been given during the day, but this probably did not contain the acrid resin. The fluid extract, in doses of ♏v–xv, is the best preparation. A tincture is also used in the dose of 15 to 60 minims. Drosera has been employed with advantage in hay asthma, gastric catarrh, gastric ulcer and atonic dyspepsia.

**DUBOISIA.—Duboisia.**

*Preparations.*

*Tinctura Duboisiæ.*—Tincture of Duboisia. *Dose,* ♏v–x.

*Extractum Duboisiæ Fluidum.*—Fluid Extract of Duboisia. *Dose,* ♏x–xx.

*Extractum Duboisiæ.*—Extract of Duboisia. *Dose,* gr. $\frac{1}{6}$–$\frac{1}{2}$.

*Duboisinæ Sulphas vel Hydrobromas.*—Duboisine Sulphate or Hydrobromate. *Dose,* gr. $\frac{1}{150}$–$\frac{1}{30}$.

**Pharmacology.**—The portion of the Duboisia myoporoides (Solanaceæ), a large Australian tree, which is used in medicine is the leaves, which have a bitter, acrid taste, but very slight odor, and contain an alkaloid, **Duboisine,** closely resembling atropine, and identical with hyoscyamine. Duboisine sulphate is a yellowish, soft, gum-like mass, soluble in water.

Hyoscyamine and hyoscine are also found in this plant, and Merck announces the presence likewise of a base which he calls pseudo-hyoscyamine and which is said to be not identical with any other solanaceous alkaloid.

**Physiological Action.**—The effects of duboisia are the same as those of belladonna, although, on account of its greater solubility, its effects are manifested more quickly and pass away sooner than those of belladonna. Experience has shown that the frequent administration of duboisine exerts a deleterious influence upon nutrition, irrespective of whatever digestive derangement it may occasion. The presence of gastro-intestinal disorder aggravates its depressant effect upon the nutritive processes. The drug must, therefore, be administered with caution to persons of feeble constitution.

**Therapy.**—It is used in medicine for the same purposes as belladonna, and is antagonistic to morphine. In ophthalmology a solution of 1 per cent., or 4 grains to the ounce of distilled water, may be instilled for making examinations, etc. Its effects upon the pupil pass off more quickly than a similar solution of atropine. Various nervous disturbances occasionally follow the use of a collyrium containing duboisine,—faintness and strange sensations in the head, as in Dr. Seely's case, and a feeling of impending death, giddiness, pain over the heart, and hallucinations, as in a case reported by Aubone.* Crouzet met with a case in which the application of duboisine to the eye gave rise to frequent pulse, extreme weakness, rise of temperature and disturbances of speech similar to those of aphasia.

Duboisine has been found useful as a sedative in cases of alienation accompanied by restlessness and great mental excitement. Dr. H. Gellhorn has lately published a communication upon the use of duboisine sulphate in various forms of cerebral disease. He administers the drug both by the mouth and hypodermically, the dose for injections being from $\frac{1}{80}$ to $\frac{1}{50}$ grain for women and $\frac{1}{50}$ to $\frac{1}{30}$ grain for men. In a few instances slight pain was caused by the injections but abscesses or extensive infiltration were not observed. The cases in which a favorable action was witnessed were progressive paralysis, senile dementia, secondary imbecility, hallucinations, idiocy, acute melancholia, periodic mania, hallucinations from injury and alcoholo-nicotinism. Dr. Gellhorn esteems this preparation as a prompt sedative in cases of alienation attended with excitement. It possesses the advantage over hyoscine of being less dangerous. A rapid subsidence of the tremor of paralysis agitans, according to Dr. Mendel, of Berlin, follows the hypodermic injection of duboisine. The effect continued for several hours. Prof. Albertoni, Belmondo and Samuely have witnessed a notable effect upon the convulsions of hystero-epilepsy produced by the injection of $\frac{1}{130}$ grain of duboisine sulphate.

The effect of the remedy is not always at once apparent, but may be postponed to the second or third day. To correspond with this slowness of action its influence is generally continued for a considerable period. Duboisine is, in general, more efficient in chronic than in acute insanity. It is not adapted for use as a general hypnotic, as the sleep which it produces is not of a refreshing character. It has, however, a beneficial effect as a hypnotic in cases of insomnia caused by intense motor excitement.

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* *Medical Bulletin*, January, 1890, p. 14.

Duboisine may, moreover, cause loss of appetite, headache, giddiness and the symptoms of belladonna poisoning. According to Evensen, duboisine will sometimes give rise to hallucinations of sight.

Loiacono and Masuro, in a number of cases of epilepsy, observed improvement in two-thirds of the cases from the use of duboisine sulphate. Birnabee has found this remedy injected daily serviceable in the morphine habit. The craving for morphine seemed to be destroyed.

### **DULCAMARA** (U. S. P.).—**Dulcamara, Bitter-Sweet.**

*Preparations.*

*Extractum Dulcamaræ Fluidum* (U. S. P.).—Fluid Extract of Dulcamara. *Dose,* ♏xxx–f℥j.

*Extractum Dulcamaræ.*—Extract of Dulcamara. *Dose,* gr. v–x.

**Pharmacology.**—The young branches of Solanum dulcamara (Solanaceæ) are official and also a fluid extract. A decoction may be made (1 to 16) and given in doses of f℥ss–iij. A bitter, amorphous substance exists in this plant, which, upon being decomposed, yields a bitter alkaloid, **Solanine,** crystallizing in white needles, readily soluble in alcohol, less soluble in water; its salts are soluble in either alcohol or water.

**Physiological Action.**—Eruptions upon the skin attended by duskiness and itching are among the effects of poisoning, which is likely to occur in children, from eating the berries. It also causes vomiting, dizziness, convulsive attacks, abdominal pains, thirst, heat and dryness of the throat, rapid respiration and pulse, and prostration of vital powers. In the ordinary doses it does not produce these effects, but acts as a sedative and mild narcotic.

A distinct anaphrodisiac effect has been noted in patients during the administration of dulcamara.

The treatment in cases of overdose would be large amounts of warm water to wash out the stomach, and hypodermic injections of morphine and atropine, with ether or alcohol.

**Therapy.**—Dulcamara is seldom used at present, although it is believed to be serviceable in chronic skin affections of a scaly character. The recent decoction may be used as a diaphoretic in rheumatism, or acute bronchitis and colds. The extract may be given in mania, and especially nymphomania or satyriasis.

Desnos has reported favorably concerning the use of solanine in painful affections of the stomach. He usually administered in pill form and in doses of $\frac{3}{4}$ grain half an hour before meals. If the pain is very severe the remedy may be beneficially given in gummy solution. Solanine was found of service in gastralgia, painful dyspepsia, alcoholic gastritis with or without dilatation of the stomach, ulcer of the stomach and cancer of the pylorus. Good results have also been reported from the use of solanine in various forms of neuralgia, in locomotor ataxia, asthma, muscular rheumatism, chronic bronchitis and the vomiting of pregnancy.

It is claimed that dulcamara is benefical in the diarrhœa of children, when caused by exposure to cold or damp.

## ECHINACEA.

*Preparation.*

*Tinctura Echinaceæ.* *Dose,* ♏x–f℥j.

**Pharmacology and Therapy.**—Echinacea augustfolia, a plant growing in our Western States, is said to possess active therapeutic properties, especially as an antiseptic. A tincture made by macerating 1 pound of the root in 1 pint of alcohol has been used, diluted with water, as a local application to chronic ulcers, abscess-cavities, and wounds. Internally, in doses of 10 drops, it is recommended in cholera infantum and cholera morbus. It is also reported to be useful in typhoid fever, malarial fevers, measles, small-pox, erysipelas, diphtheria, boils, and carbuncles. The tincture has been used with asserted success in the case of several individuals who had been bitten by rabid dogs. In some cases it seems to be prophylactic, while in others it favorably modified the symptoms. It is said to be an antidote to bites or stings of venomous insects or reptiles.

## ELATERINUM (U. S. P.).—Elaterin.

**Dose**, gr. $\frac{1}{20}$–$\frac{1}{12}$.

*Preparation.*

*Trituratio Elaterini* (U. S. P.).—Trituration of Elaterin. *Dose,* gr. $\frac{1}{2}$–$\frac{2}{3}$.

**Pharmacology.**—The fresh, expressed juice of the fruit of Ecbalium elaterinum (Cucurbitaceæ), upon standing, deposits a peculiar, resinous substance, which is collected upon muslin and dried, forming flat pieces of variable thickness and irregular shape, of a pale-green or grayish color, mostly amorphous, but containing some crystals. This constitutes commercial, and formerly official, elaterium. Elaterinum exists in the proportion of from 15 to 40 per cent. in elaterium, and on account of this variability in strength the latter has been dropped from the Pharmacopœia, and the more reliable elaterin substituted. The elaterin is extracted from elaterium by chloroform and precipitated from the chloroform solution by the addition of ether, in which it is nearly insoluble. In prescribing, elaterin must not be dispensed for elaterium, as it is from two to six times stronger. Elaterin is crystalline, odorless, intensely bitter and acrid, soluble in chloroform, fusel-oil, or carbon disulphide, and in 125 parts of alcohol. It is a neutral substance, and is not precipitated by tannic acid or by salts of mercury.

**Physiological Action.**—It is violently purgative, causing profuse, watery stools with griping, and in large doses producing great prostration. Death has resulted from excessive doses. Dangerous symptoms require demulcents, opiates, and stimulants. It must be used with caution in elderly persons. It purges when injected hypodermically, but to obtain its full effects it must be mixed with the bile. It also occasions an excessive flow of saliva.

**Therapy.**—In ascites, uræmia, cerebral congestion, pulmonary œdema, and poisoning by narcotic substances, elaterin affords a ready means of evacuating the bowels, and of reducing the volume of circulation by draining water from the vessels, or "bleeding through the tissues." It should not be given for ordinary constipation, as it is too depressing.

On account of its great activity a small fraction of a grain may produce collapse from hypercatharsis. The trituration, therefore, in which the drug is reduced by triturating it with 9 parts of sugar of milk, is an eligible and useful preparation. According to Dr. Hyde Salter, a small dose of elaterium, given on alternate mornings, is of value in dropsy dependent on aortic disease.

### ELEMI.—Elemi.

**Pharmacology.**—The Canarium commune (Burseraceæ), a tree of the Philippine Islands and the southern portion of the American continent, affords an oleoresin, obtained from incisions into the living bark. This substance, somewhat resembling granular honey when fresh, becomes more solid and friable when kept for some time. The taste is rather pungent and bitter. It contains 60 per cent. of amorphous resin, **Brein**; 25 per cent. of crystallizable resin, **Amyrin**; about 10 per cent. of a volatile oil, besides a crystallizable, bitter, acrid substance, **Bryoidin**; also, brëidin and elemic acid.

**Physiological Action.**—It has stimulating and irritating properties, and is only used as an ingredient in plasters and ointments, or for use externally. It is similar to other terebinthinate agents in its effects. The British Pharmacopœia recognizes an ointment of elemi, composed of ¼ ounce of elemi and 1 ounce of simple ointment.

**Therapy.**—Used as an application to enlarged joints, and as a resolvent to swollen glands. It may also be applied to indolent ulcers, and is a good dressing for burns, blisters and chilblains.

### EMBELIA RIBES.—Babarang.

**Dose**, ʒi–iv.

**Pharmacology and Therapy.**—The Embelia ribes (Myrsineæ) is a climbing plant of Southern China, Eastern India, and Malaya. The dried and powdered fruit is used, or the fluid extract of the fruit (dose, fʒi–iv). It is an efficient anthelmintic and tæniacide; is believed to be a specific in rheumatism; and is an alterative in chronic skin diseases. In cases of flatulent dyspepsia it is claimed to be serviceable. The active principle was found to be an acid, which has been named **Embelic acid** (Warder), and is insoluble in water. It forms salts with soda-potash, and ammonia, the latter being most readily obtained crystalline.

Ammonium embelate occurs in the form of red needles or powder devoid of taste. This ammonium salt was found effective as an anthelmintic against tænia, in doses of 6 grains for adults, or 3 for children. It is administered in syrup, to be followed by castor-oil. It has the advantages over male fern of smallness of dose and tastelessness. It kills the worm. The powdered seeds may be given with milk early in the morning, fasting, followed by a purgative some hours later. The dose of the powder for a child is a teaspoonful twice a day as a tæniacide, or about the same quantity of a fluid extract.

### EPHEDRA.—Ephedra, Mormon Tea.

**Pharmacology.**—The stems or the whole herb of Ephedra antisyphilitica (Gnetaceæ?) is used in Arizona as a recent infusion, or in the form of fluid extract (dose, fʒi–ij) as an alterative, and especially in treatment of gonorrhœa and syphilis. It contains a peculiar kind of tannin, to which its effects are probably attributable, according to Professor Oscar Loew's analysis; although in a Japanese variety, E. vulgaris, Professor Nagai discovered an alkaloid, which he named **Ephedrine.**

The physiological action of ephedrine has been studied by Professor Bogoslowski, who concludes that it influences especially the motor apparatus of the heart and probably also the cardiac muscle. It at first reduces blood-pressure for a short time and accelerates the pulse, but arterial pressure is finally elevated and the pulse retarded. The respiration is quickened in the beginning by small doses, but, under the influence of larger amounts, sooner or later becomes slow and irregular. The pupils are dilated and salivation occurs. Professor Bogoslowski places the active dose of the alkaloid at 1½ to 7½ grains for adults. The best preparations for use are the fluid extract and the ephedrine hydrochlorate.* The alkaloid occurs in the form of colorless crystals. Ephedrine hydrochlorate is also colorless. The salt is soluble in water.

Ephedrine, in 10-per-cent. solution, is a mydriatic, dilating the pupil without irritation in forty to sixty minutes. Under the name of mydrine a combination of ephedrine and homatropine has been employed and is esteemed particularly serviceable for diagnostic purposes on account of the transitory character of its action. Mydrine is a white powder, soluble in water. It is used in the strength of 5 grains dissolved in 45 minims.

**Therapy.**—Dr. H. H. Rusby† is satisfied that the reputation of this drug as a remedy in gonorrhœa and in syphilis has some solid foundation. As an anti-blennorrhagic its action is probably very similar to that of astringents now in use. As a remedy in syphilis, he says, its value is, probably, solely that of a depurative. In the removal from the system of the accumulated products of the disease, ephedra will take rank with any agent now in use, with the single exception of potassium iodide, and it may well serve to alternate or combine with that drug. It is also considered by persons living in the region of its growth to be a "sure and speedy cure for skin diseases."

Ephedra vulgaris has long had a popular reputation in Russia as an anti-rheumatic remedy. Clinical experiments by Dr. Bechtine in the service of Professor Popow showed it to be of value especially in acute articular and muscular rheumatism. It was also found to have some laxative effect and to act as a decided diuretic.

**EPIGÆA.—Epigæa, Trailing Arbutus.**

**Dose,** ʒss–ij, in infusion or fluid extract.

**Pharmacology.**—The Epigæa repens (Ericaceæ) is a small, herbaceous plant, with sweet-smelling flowers. The part used is the leaves, which are odorless, bitter, and astringent. They contain **Arbutin, Ursone,** and tannic acid.

**Therapy.**—The constituents of the plant are very much the same as those of Uva ursi, and its uses are similar. It is given as an astringent in vesical catarrh, blennorrhœa, etc.

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* *Medical Bulletin*, August, 1894.

† *Druggists' Bulletin*, 1888, p. 220.

**ERGOTA** (U. S. P.).—**Ergot of Rye.**
**Dose,** gr. x–ʒj.

*Preparations.*

*Extractum Ergotæ Fluidum* (U. S. P.).—Fluid Extract of Ergot. *Dose,* ♏x–fʒij.

*ExtractumErgotæ* (U. S. P.).—Extract of Ergot. *Dose,* gr. v–x.

*Vinum Ergotæ* (U. S. P.).—Wine of Ergot (15 per cent.). *Dose,* fʒj–f℥j.

*Ergotin.*—A mixture of constituents of varying strength and physiological action, best represented by the official extract.

**Pharmacology.**—Ergot is the compact spawn or sclerotium of the Claviceps purpurea (Fungi) replacing the grain of Secale cereale (Gramineæ). The rye-ergot is the only one official, although it affects other grasses. The Ustilago maidis of corn is very similar in chemical composition and effects. Ergot is in grain-like masses, from 1 to 2 inches long and about $\frac{1}{8}$ inch thick. The grains are nearly triangular, somewhat curved, and marked lengthwise by three grooves, thickest in the middle and tapering toward each end; of a dark-purplish color externally, they are nearly white in the centre. They have a heavy, unpleasant odor and a fatty, mawkish, disagreeable taste. The addition of a strong alkali develops an odor like that of herring-brine (trimethylamine). It contains about 35 per cent. of fixed oil, a peculiar sugar, and two coloring matters. Chemists have isolated or derived a number of more or less active principles from ergot, the most prominent being **Sclerotinic acid** (Dragendorff), **Scleromucin,** and **Primethylamine**; but, according to Kobert, sclerotinic acid is itself a compound body, of which ergotinic acid is the largest constituent. **Sphacelinic acid** and **Cornutin,** according to this authority, represent the portion of the drug causing ergotism, the former producing gangrenous ergotism through its action upon the blood-vessels and vaso-motor centres, the latter causing convulsive ergotism having a special action upon the nerve-centres. Cornutin is also held by him to be the principle which acts upon the uterus, causing contraction of its muscular fibres. None of these so-called principles, singly, represent the physiological activity of the drug; which, however, can be nearly substituted by the combination of them in the aqueous extract, or ergotine, or a good fluid extract, which is the most reliable form in which to use it. When kept for some time ergot loses its virtues, and should be as fresh as possible in order to be effective. A substance similar in composition to cholesterin, and therefore termed ergosterin, has been extracted from ergot by C. Tanret.

**Physiological Action.**—No local effects are observed from application of ergot to the skin; upon mucous membranes it acts as an astringent. Upon the nervous system little effect is produced directly, although in ergotism we have convulsions and other nervous symptoms, caused indirectly. It induces anæmia of nerve-centres by exerting a selective action upon their blood-vessels, which it causes to contract. When introduced into the circulation, there is, first, a fall of blood-pressure, soon followed by a rise; the primary fall is most marked where a large amount comes in contact with the heart-muscle, which is depressed by it, and paralysis of the heart may cause death after intravenous injection of ergot. The rise of blood-pressure represents the physiological stimulating action of the drug upon the vaso-motor centres and upon the unstriped muscular fibres in the arterioles.

The action of ergot upon the uterus is due to a primary influence upon the lumbar cord, according to the experimental study of Hemmeter. It produces intestinal peristalsis and contraction of arterioles and capillaries by a centric action. The effects of ergot upon the parturient uterus are those of a stimulant to the contractions, increasing their force and frequency until the full action is brought about of tetanic contraction of the organ. Upon the non-parturient uterus the effects are more marked in checking the blood-supply. The lower animals abort after eating ergotized grain, and in some States there are laws against the administering of ergot to pregnant women in order to produce miscarriage; but such result does not follow the use of ergot in ordinary medicinal doses, although in chronic ergotism this accident may occur.

**Toxic Effects.**—When an overdose is administered, effects result which are known collectively as **acute ergotism.** The symptoms are peculiar restlessness, with anxiety, headache, vertigo, dilated pupils, tinnitus aurium, with hyperacusis, the action of the heart is slowed, the pulse is weak, respirations reduced in frequency, and, as the effects increase in intensity, suddenly nausea and vomiting occur, even when the drug is introduced hypodermically. This cerebral vomiting is distinct from the local effects of the drug when taken by the mouth, when vomiting may occur early if the stomach is very sensitive. Coldness of the surface is a prominent symptom and seems to depend upon a general depression of temperature.

**Chronic ergotism** occurs in regions of the country, notably in Europe, where rye-bread is the staple food, in seasons when ergot is most present in the grain. It appears in two forms, the convulsive and the gangrenous, the former being characterized by vertigo, dimness of vision, and numbness of the extremities, followed by tonic contractions, particularly of the flexor groups of muscles. Attacks of dyspnœa also occur, resembling asthma, caused by tetanoid contractions of the respiratory muscles. Cramps of abdominal muscles, colic, and diarrhœa take place; the pulse is slow and weak; the surface of the body is cold; the symptoms increase in intensity; the special senses are affected; hearing and smell are lost; the pupils are permanetly dilated, and vision is impaired. The case may be terminated by clonic convulsions or death result from exhaustion. The gangrenous form is marked by the intensity of the local phenomena, the numbness of the fingers and toes terminating in vesications, and moist or dry gangrene, more or less extensive, destroys these parts, or may affect the nose or other portions of the body. It is evident that in chronic ergotism there is a profound dyscrasia, perhaps attributable as much to the unhygienic mode of life and poor food as it is to the toxic effects of ergot. Such grave effects are not observed from the medicinal administration of ergot, even when continued for a long time. The prolonged administration of ergot has, however, been known to cause a vesicular, pustular and furuncular eruption with petechiæ.

**Treatment of Poisoning.**—The phenomena of acute ergotism are easily controlled by placing the patient in a hot bath and administering cardiac and arterial stimulants, such as coffee. Amyl nitrite, aconite, veratrum viride, and tobacco antagonize the effects of ergot upon the circulation. The treatment of chronic ergotism is mainly hygienic and symptomatic.

**Therapy.**—Ergotin made into a paste with water has been employed locally in conjunctivitis, gonorrhœa, endocervicitis, acne rosacea, and incipient boils. Ergot is valuable in hæmorrhoids, prolapsed rectum, and relaxation of the sphincter ani, when applied upon a tent or introduced as suppositories. Incontinence of urine, due to relaxed sphincter, is cured by ergot given in this manner, or administered by the mouth.

By Dr. T. Clemens ergotin is said to be a valuable remedy in the ammoniacal cystitis of paraplegic patients. The bladder is injected with a solution containing about 4 grains to the ounce, and the drug is, at the same time, administered by the mouth.

Chronic follicular pharyngitis is sometimes improved by the topical application of the fluid extract, or of ergotin in the proportion of 10 to 20 grains to the ounce. The oil of ergot is a valuable local medicament in seborrhœa, removing the sebaceous material, and, at the same time, by its astringent and stimulant action, benefiting the diseased follicles and glands. Locally, in the diseases referred to, ergot may be prescribed according to the appended formulæ:—

| | |
|---|---|
| ℞ Ergotinæ, | ʒss. |
| Cocainæ hydrochloratis, | gr. v. |
| Plumbi carbonatis, | ℥ss. |
| Ungt. aquæ rosæ, | ℥ss. |

M. For external use in acne rosacea and in boils.

| | |
|---|---|
| ℞ Ergotinæ, | ʒj. |
| Sulphuris sublimati, | ʒss. |
| Mentholi, | gr. v. |
| Ext. belladonnæ folior alc., | gr. x. |
| Ungt. zinci oxidi, | ℥ss. |

M. Valuable in fissures of the nose, mouth, rectum, and in hæmorrhoids.

| | |
|---|---|
| ℞ Ergotinæ, | gr. v. |
| Camphoræ, | gr. x. |
| Ext. opii, | gr. iiss. |
| Plumbi acetatis, | gr. xx. |
| Ol. theobromatis, | q. s. |

M. et ft. suppositoriæ no. x.

Sig.: Insert one in the bowel when necessary for prolapsed rectum, diarrhœa, or for fissure of rectum.

| | |
|---|---|
| ℞ Extracti ergotæ fl., | |
| Extracti hamamelidis fl., | āā f℥iss. |
| Glycerini, | f℥j. |

M. Sig: Apply several times a day for chronic pharyngitis and nasal catarrh.

| | |
|---|---|
| ℞ Olei ergotæ, | f℥iij. |
| Lanolini, | ℥j. |
| Ol. verbenæ, | ♏v. |
| Ol. rosæ, | ♏iij. |

M. Sig.: Rub into the scalp well once or twice a day for dandruff. Useful, also, in loss of hair and sycosis.

Ergot is a reliable remedy in the several forms of capillary hæmorrhage, and in overcoming the congestion attendant upon and causing the oozing. In hæmoptysis, epistaxis, hæmaturia, bloody discharges from the bowels (melæna), and in uterine hæmorrhage, ergot in half-drachm doses of the fluid extract, repeated every hour or two, will generally promptly cause cessation of the bleeding. Ergot may be prescribed for various hæmorrhages with advantage, combined with geranium and witch-hazel :—

| | |
|---|---|
| ℞ Extracti ergotæ fl., | f℥iss. |
| Extracti geranii fl., | f℥j. |
| Extracti hamamelidis fl., | f℥iss. |

M. Sig.: A teaspoonful or two every half hour or hour until bleeding ceases.

Blaschko, of Berlin, employs the following formula in hæmoptysis :—

| | | |
|---|---|---|
| ℞ Ergotin, | | |
| Acid. gallici, | āā | gr. xv. |
| Syr. althææ, | | |
| Aq.destill., | āā | fʒvj. |

M. Sig. : Teaspoonful every two hours.

In severe cases of hæmoptysis, in post-partum hæmorrhage, and hæmatemesis, a better practice is to administer the fluid extract or ergotin by subcutaneous injection. The same method is preferable when ergot is used in the treatment of fibromyomata of the womb, and may be resorted to in order to check the intestinal hæmorrhage of typhoid fever. Where uterine hæmorrhages are due to submucous polypi or fibromyomata, ergot not only checks the hæmorrhages, but causes the separation and expulsion of the growth; in such cases the progress of the treatment should be accelerated by dilatation of the cervix uteri, incision into the capsule, if one exists, and removal of the growth by surgical operation. In multipara, where there is a history of flooding after previous labors, full doses of ergot should be given just before the delivery of the child. The usual rule for the administration of ergot is to wait until the child's head is upon the perineum before giving it; otherwise there may be an hour-glass contraction, or tetanic contraction with unyielding os, and the child's life be endangered. The administration of a drachm of fluid extract of ergot, after labor has terminated, prevents relaxation of the organ and the formation of large clots which cause after-pains.

In subinvolution of the uterus, Professor Barton Cook Hirst recommends :—

| | |
|---|---|
| ℞ Strychnin. sulphat., | gr. $\frac{1}{20}$. |
| Quinin. sulphat., | gr. ij. |
| Extr. ergotæ, | gr. j. |

M. et ft. pil. no. j. Mitte tales no. xxx. Sig.: One pill three times a day.

In night-sweats, ergot may be give alone in full doses, or combined with picrotoxin or atropine. This remedy has likewise been found of advantage in the treatment of galactorrhœa. Ergot is often of avail in hyperidrosis. It is efficacious in all varieties of purpura, and in severe cases of the hæmorrhagic form may very properly be hypodermically injected. This drug is of value in the treatment of chronic diarrhœa and dysentery.

In dysentery of children, accompanied by severe pain and excessive tenesmus, the following preparation is beneficial:—

| | | |
|---|---|---|
| ℞ Cocain. hydrochlorat., | | gr. j. |
| Extr. ergotæ, | | gr. x. |
| Extr. opii, | | gr. ij. |
| Aristol, | | gr. v. |
| Ol. theobromatis, | | q. s. |

M. et ft. suppos. no. x. Sig.: One every two or three hours.

Good results have also been obtained from the administration of the fluid extract of ergot in acute dysentery alone or combined:—

| | | |
|---|---|---|
| ℞ Extracti ergotæ fl., | | |
| Extracti hamamelidis fl., | āā | f℥iss. |
| Elix. guaranæ, | | f℥ij. |

M. Sig.: Two teaspoonfuls in water every two or three hours.

In passive or hypostatic congestion of the lungs, it may be combined with digitalis with advantage:—

| | | |
|---|---|---|
| ℞ Ergotinæ, | | gr. iv. |
| Extracti digitalis, | | gr. iij. |
| Pulv. ipecacuanhæ co., | | gr. xxiv. |

M. et ft. pil. no. xij.
Sig.: A pill every three or four hours.

| | | |
|---|---|---|
| ℞ Ergotinæ, | | gr. xv. |
| Glycerini, | | |
| Aquæ destillatæ, | āā | fʒj. |
| Aquæ acidi carbolici, | | ♏xxx. |

M. Sig.: Inject hypodermically, from 20 to 30 minims from two to four times a day in hæmoptysis.

In diabetes insipidus the fluid extract of ergot produces marked effect on the disease, having a decided influence in controlling the urinary excretion of water. It is serviceable in congestive dysmenorrhœa, paralysis of the bladder, congestive form of migraine, and in hyperæmia of the cord. Ir is claimed that ergot is capable of relieving whooping-cough. Favorable results have been claimed in diabetes mellitus from the hypodermic injection of ergotin or ergotinin. Varicose veins are restored to their normal calibre by hypodermic injections of ergotin, and Bartholow strongly recommends this mode of treatment as efficacious in variocele. The needle should be thrust among the enlarged veins in such a manner as not to wound their walls. Injected into the neighborhood of an aneurism, or administered by the mouth, ergot proves valuable by favoring the coagulation of blood within the sac. Enlarged spleen may be reduced by the same methods. Ergot combined with iron has very often a beneficial action in this same affection:—

| | | |
|---|---|---|
| ℞ Extracti ergotæ fl., | | |
| Tincturæ ferri chloridi, | | |
| Glycerini, | āā | f℥j. |

M. Sig.: From one to two teaspoonfuls in water three or four times a day.

In some skin diseases, notably acne rosacea, the internal administration of ergot conjoined to local measures is of advantage.

From its effects upon the vascular supply of the spinal cord, Brown-Séquard has proposed its use in some forms of paraplegia attended by signs of local irritation and hyperæmia of the cord. It is useful in congestive headache and in chronic mania, and has been used with asserted good result in spermatorrhœa and incontinence of urine. The hypodermic injection of ergotin is said to afford relief in facial neuralgia.

From Buda-Pesth cornutin is recommended as having an efficient action upon unstriped muscular tissue, while it is, at the same time, less dangerous than the other constituents of ergot. Pure cornutin is a brownish-gray, amorphous powder, almost insoluble in water. The hydrochlorate or citrate is more readily soluble. Dr. Meisels has administered the drug in daily doses of 1 centigramme (about $\frac{1}{6}$ grain), divided into four portions. In hæmorrhages from the genito-urinary organs cornutin rapidly caused a cessation of the bleeding. He observed it act promptly in gonorrhœa accompanied by hæmorrhage from the bladder or urethra, in hæmorrhage from cystitis and during the lying-in period from atony of the womb with subinvolution. Professor Bokai has given cornutin citrate with excellent results in spermatorrhœa of the paralytic type.

When impaired vision depends upon congestion of the retina incident to dilated or hypertrophied heart and in cases of epilepsy when hemicrania occurs in the intervals of rest, when the pupils are contracted and vision disordered, ergot has been used with advantage. In the treatment of psychoses associated with intra-cranial congestion and perhaps inflammation, ergot is a valuable adjunct to other modes of treatment.

**ERIGERONTIS OLEUM** (U.S.P.).—**Oil of Erigeron, Canada Fleabane. Dose,** ♏xx–xxx.

**Pharmacology.**—A volatile oil distilled from the fresh flowering herb of Erigeron Canadense* (Compositæ). It is an amber-colored liquid, with slightly-pungent taste and characteristic aromatic odor, resembling that of turpentine. It has diuretic and hæmostatic properties. The fluid extract (alcoholic) is also used. Dose, f℥i–ij.

**Therapy.**—The oil of erigeron is very efficient in cases of uterine hæmorrhage (metrorrhagia), especially when of passive character. Menorrhagia may likewise be checked by the exhibition of this remedy. It has also been used in controlling other hæmorrhages, such as epistaxis, and hæmorrhage from the bowel is similarly arrested by the oil of erigeron, which has proved successful likewise in dysentery. Erigeron is often an effective remedy in hæmoptysis. Dr. De Puy states that he has used this remedy with success in diarrhœa and dropsy.

This remedy may be given simply dropped upon sugar, in an emulsion, or in capsules. It has also some influence over the genito-urinary mucous membrane, and is useful in the declining stage of gonorrhœa.

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* Prof. J. Foster Flagg recommends the dried flowering herb of erigeron as a good local styptic for bleeding of the skin, especially from cuts after shaving. He also gives two drops of a tincture made by absolute alcohol two or three times a day as an anti-hæmorrhagic. One or two drops of this same tincture of erigeron in half a teaspoonful of water is likewise given by Dr. Flagg for acute hæmorrhage every minute to a half hour, or as indicated.

**ERIODICTYON** (U. S. P.).—**Eriodictyon, Yerba Santa.**

*Preparations.*

*Extractum Eriodictyi Fluidum* (U. S. P.).—Fluid Extract of Eriodictyon. *Dose*, ♏xv–xxx.

*Extractum Eriodictyi.*—Extract of Eriodictyon (made by evaporating the fluid extract to a pilular consistency). *Dose*, gr. iii–xv.

**Pharmacology.**—The leaves of the Eriodictyon glutinosum (Hydrophyllaceæ), of California, have a fragrant odor and an aromatic, sweetish taste, and contain an active resin and a volatile oil. The effects are most evident in the bronchial mucous membrane, to which it is a stimulant and expectorant.

**Therapy.**—Yerba Santa has a reputation in the treatment of bronchitis, laryngitis, and consumption. It has likewise been found beneficial in asthma, and may be very well administered in conjunction with grindelia robusta. It is used as a vehicle for the administration of quinine, the bitterness being overcome by the aromatic principles of the plant. Messrs. Parke, Davis & Co., who introduced this remedy to the profession, provide an aromatic syrup of yerba santa, of which a teaspoonful completely masks the bitterness of 2 grains of quinine sulphate.

| | | |
|---|---|---|
| ℞ | Quininæ sulphatis, | gr. xlviij. |
| | Ext. belladonnæ fl., | ♏ij. |
| | Syrupi eriodictyi aromat., q. s. ad | f℥ iij. |

M. Sig.: A teaspoonful four times daily in laryngitis or chronic bronchitis.

**ERYTHROPHLŒUM.**—**Erythrophlœum.** See Casca Cortex.

**ESCHSCHOLTZIA.**—**Eschscholtzia.**

**Dose,** gr. xxx.

**Pharmacology.**—The Eschscholtzia Californica (Papaveraceæ) enjoys a reputation upon the Pacific coast of this country as a soporific and analgesic, and is known as the California poppy. It is represented by a number of varieties, and it is necessary to obtain the genuine species, as some appear to be inert. It is claimed that it possesses a small amount of **Morphine,** although other principles not yet isolated contribute toward producing its effects, among which is **Sanguinarine.** Professor Schmidt, from his examination of the plant, is unable to confirm the statement that it contains morphine.

**Physiological Action.**—The effects upon animals are gradual slowing of respiration after a brief preliminary increase of rapidity; death is due to failure of respiration. The effect upon the nervous system is that of a narcotic. The motor nerves are affected before the sensory. The cumulative effects in human subjects resemble those produced by codeine. Though its narcotic effects are not very decided, yet they continue for a considerable period after its discontinuance.

**Therapy.**—It is claimed that the eschscholtzia is an efficient though harmless soporific agent, especially for children. It relieves pain and induces sleep, relieves tremor, and agrees well with the digestive organs. Eschscholtzia, in the form of the fluid extract or the syrup (fʒss–v at a dose), is a good addition to cough mixtures where the use of opium is not considered advisable.

## **EUCALYPTUS** (U. S. P.).—**Eucalyptus, Australian Blue-Gum Tree.**

### *Preparations.*

*Oleum Eucalypti* (U. S. P.).—Oil of Eucalyptus. *Dose,* ♏iii–xx.
*Extractum Eucalypti Fluidum* (U. S. P.).—Fluid Extract of Eucalyptus. *Dose,* ♏v–fʒj.
*Tinctura Eucalypti.*—Tincture of Eucalyptus (f℥ii–Oj). *Dose,* fʒi–iv.
*Aqua Eucalypti.*—Water of Eucalyptus. *Dose,* fʒii–iv.
*Eucalyptol* (U. S. P.).—*Dose,* ♏v–xxx.

**Pharmacology.**—The blue gum of Australia is a tall tree that has been of considerable interest to sanitarians, since it is easily cultivated in marshy grounds, and is said to render malarious districts healthy, such as the Campagna, where they have been recently planted. This is partly on account of the volatile oil and resins of the tree, and partly because it drains the soil of water, the exhalation of water from the leaves being said to be equal in amount each day, on an average, to the weight of the tree. The leaves are the official portion of the plant, Eucalyptus globulus (Myrtaceæ). They should be collected from rather old trees, as those from young trees are smaller and less aromatic. They have a camphor-like odor and a pungent, bitter taste; contain a volatile oil, a crystallizable resin, and some tannin. The oil is soluble in ether, alcohol and the fatty oils. It does not become resinous on exposure to the air. The volatile oil, by fractional distillation, is separated into three oils of different density, the lightest and most important being **Eucalyptol,** the others being **Terpene** and **Cymol.** Pure eucalyptol is a colorless fluid and has an odor resembling that of camphor. It is soluble in alcohol, ether, chloroform and the fatty oils, but does not dissolve in water. The fluid extract, being made by percolation with alcohol, is a strong tincture. A medicated water, made like the official waters, is useful as a vehicle for alkaloids for hypodermic use, as it prevents fermentation and deterioration; it is also a vehicle for medicated sprays. Alkalies, mineral acids, and metallic salts (iron, mercury, lead, zinc) are chemically incompatible with preparations of this drug; while tonics, simple and aromatic bitters, essential oils, turpentine, camphor, cubeb, etc., are synergistic, and increase its physiological and therapeutic effects.

**Physiological Action.**—Eucalyptus is obnoxious to lower forms of life and is a good disinfectant. Applied to the skin, the oil is an irritant, increasing the local blood-supply and partly diffusing into the blood where it produces systemic effects. The vapor of eucalyptus, inhaled in quantity, also produces systemic effects besides its local action upon the bronchial mucous membrane. In the mouth it is pungent, aromatic, camphor-like, or resembling cubeb in its impressions upon the nerves of taste. Eucalyptus excites the flow of saliva and leaves a disagreeable, hot, astringent flavor. In the stomach a sensation of warmth is felt, and it acts as a carminative and antiseptic; the appetite and digestion improve, and the secretion of the gastric juice and of the intestinal fluids is increased. It favors the evacuation of the bowels, and the alvine evacuations are somewhat more copious. This drug is a diaphoretic and diuretic, the eucalyptol being eliminated largely by the kidneys, but also through the skin and bronchial mucous membrane.

Eucalyptus sometimes communicates to the urine an odor which has been likened to that of violets. The excretion of urea is augmented; the action of the heart is increased; the arterial tension is at first increased, then lowered. The respiratory movements are accelerated Eucalpytus inhibits the amœboid movements of the white blood-cells. Very large doses cause gastric distress, indigestion, diarrhœa, with congestion of the kidneys, the characteristic odor of eucalyptus being recognized in the urine, breath, and discharges from the bowels. The action of the heart and lungs is decreased and the temperature falls. Wakefulness is one of the physiological results, but it may indirectly favor sleep in debilitated conditions of the system. Paralysis of the respiration causes death in the lower animals to which a lethal dose has been given. Its action may be summed up as antiseptic, carminative, digestive, tonic, laxative, diaphoretic, expectorant, and diuretic.

Several cases of poisoning from the oil of eucalyptus have been reported. Dr. Alfred Neale, of New Norfolk, Tasmania, observed a fatal case, death being preceded by great embarrassment of respiration. A large quantity of blood was found in the pleural cavities, the lungs were collapsed and bloodless, and the right heart contained frothy blood.

**Therapy.**—Eucalyptus is used as an antiseptic in the treatment of wounds and ulcers, acting as a substitute for carbolic acid. An ointment of eucalyptus is official in the British Pharmacopœia. It is made by incorporating 1 ounce, by weight, of the oil of eucalyptus with 2 ounces each of soft and hard paraffin, and is a good dressing to chronic, indolent, or unhealthy ulcers. The tincture, or the water, of eucalyptus may be used externally for the same purpose. A combination of eucalyptus and iodoform is a serviceable application to chancres and chancroids. The oil is a very useful addendum to preparations for the relief of chronic eczema, in which the following combination is often found beneficial:—

| | |
|---|---|
| ℞ Hydrarg. ammoniat., | gr. xv. |
| Olei eucalypti, | ♏viij. |
| Beta-naphthol., | gr. x. |
| Pulv. marantæ, | ʒij. |
| Unguent. zinci oxidi, | ℥j.—M. |

The vapor may be used by dropping the oil upon hot water, or upon cotton-wool placed in an inhaler; or the steam-atomizer may be employed with eucalyptol-water for inhalation in phthisis, dilated bronchial tubes, bronchial catarrh with fetid expectoration, etc. Applied directly to the diseased membrane, or inhaled in a vaporized state, the oil is a good antiseptic in diphtheria. As a local application in diphtheria Dr. Marion Thrasher, of San Francisco, uses a 10-per-cent. solution of eucalyptol in pure alcohol. One part of the oil to 50 of plain or medicated water may be advantageously used as an injection in gonorrhœa. It may likewise be employed as a mild counter-irritant in bronchial and anthritic inflammations. In alopecia, when the scalp is covered and the glands occluded by a thickened and vitiated sebum, the oil of eucalyptol is of very material service. Its local stimulant effects sometimes prove valuable in anidrosis. A soap (sapo eucalyptoli) containing 5 per cent. of the oil is of utility in the treatment of foul wounds, or ulcers, and bromidrosis. In asthma, cigarettes may be smoked, containing leaves of eucalyptus, with belladonna or coca, and stramonium-leaves, associated with tobacco, if desired, and much advantage derived from it, especially if the fumes are inhaled. The fluid extract is an efficient stomachic in indigestion due to deficient secretion or to gastric or intestinal catarrh; by its use the intestinal tract becomes more healthy in character, and no longer affords a place of development for intestinal parasites. Eucalyptus is an efficient remedy in the vomiting caused by sarcinæ. In the ordinary oxyurides, or seat-worms, injections of a decoction of eucalyptus-leaves are useful, and this preparation may also be employed as a gargle for sore throat and stomatitis, scurvy, etc. The stimulating effect upon the circulation of the volatile oil is well shown in cases of palpitation, irregularity, sudden flushes, and flatulence. As the drug is antiseptic, and escapes by the bronchial mucous membrane to a considerable degree, it is serviceable in chronic bronchitis, in the declining stage of pneumonia, in incipient phthisis, gangrene of the lungs, and diphtheria.

M. J. Roussel employs a mixture of eucalyptol and carbolic acid in some bland vegetable oil in the treatment of tuberculosis. He makes use of three different preparations, which respectively contain 10, 15 and 20 per cent. each of eucalyptol and carbolic acid. To the mixture he has given the name pheneucalyptol and uses it by injection. He claims good results in phthisis, anthrax, epithelioma and lupus. The injections are said to be practic allypainless.

In acute bronchitis or laryngo-tracheitis of children, Dr. S. Solis-Cohen prescribes :—

℞ Ammon. carbonat., . . . . . . . gr. viii–xvj.
Ammon. chlorid., . . . . . . . gr. xxii–xlviii.
Extr. eucalypt. fl., . . . . . . . fʒiss.
Syr. acac.,
Syr. tolutan., . . . . . . . āā f℥ss.
Aquæ, . . . . . . . . . fʒij.
M. Sig.: A teaspoonful in milk or water every two or four hours for a child two years of age.

In subacute cases he adds a little paregoric to the above or a similar mixture.

When there is an anæmic state of the nerve-centres manifested by chorea, neurasthenia, hysteria, and asthma, benefit is derived from eucalyptol given in capsules, emulsion, or simply dropped upon sugar (♏ii–v at a dose). In rheumatic or malarial headache it sometimes proves efficacious. The oil of eucalyptus affords decided relief to the headache which accompanies epidemic influenza and is likewise efficacious in the neuralgia which may follow as a sequela. The oil of eucalyptus has been given with benefit in migraine.

Eucalyptus is believed to be especially serviceable in catarrhal affections of the genito-urinary organs, desquamative nephritis, pyelonephritis, chronic catarrh of the bladder, with putrid urine, and in gleet. It likewise effects improvement in vaginitis. In fevers, especially malarial fevers, it it useful; but it is inferior to quinine in controlling the paroxysms, being most employed in chronic malarial poisoning and in convalescence from acute attacks, when it may be used in alternation with cinchona. This remedy causes reduction of the enlarged spleen, or "ague-cake," due to malarial toxæmia.

Dr. Benjamin Bell recommends the tincture of eucalyptus to be given in drachm doses every third or fourth hour in typhoid fever, and believes that it exerts a favorable influence upon the diarrhœa. In scarlatina it is a good practice to add 5 drops of the oil of eucalyptus to the ounce of prepared lard, for use as an unguent.

### EUCALYPTEOL.

**Dose**, gr. ss–iij.

**Pharmacology and Physiological Action.**—Eucalypteol, or eucalyptene bichlorhydrate is a crystallized product derived from the essence of eucalyptus, by treating it with hydrochloric acid. Eucalypteol occurs in the form of white micaceous scales, having a camphoraceous odor and a peculiar, faintly bitter, persistent taste. This substance is soluble in ether, chloroform, fixed and volatile oils, petroleum ether and acetic ether. It is almost insoluble in water and glycerin. In alkaline solutions and cold alcohol it is partially decomposed, a substance having the odor of terpinol being formed. According to the report of Dr. Lafage, eucalypteol is well borne by the stomach, is innocuous, and is decomposed in the intestine into hydrochloric acid and eucalyptol, the latter of which is, in part, absorbed.

Eucalypteol is an efficient antiseptic, minute quantities preventing putrefaction, though it does not check the action of the digestive ferments. When taken by the mouth it is eliminated by the lungs, kidneys and bowels. Eucalypteol is likewise eliminated in the saliva. When subcutaneously injected it is removed almost exclusively by the lungs.

**Therapy.**—Eucalypteol exerts a decided antiseptic action upon the bowel. It is appropriate to the treatment not only of diseases of the respiratory passages, but also to those involving the intestine, such as enteritis, diarrhœa, typhoid fever, fetid diarrhœa, the green diarrhœa of infants, etc.

In phthisis it allays the cough and other symptoms. It is preferably given in powders or capsules.

### EUONYMUS (U. S. P.).—Euonymus, Wahoo.

*Preparation.*

*Extractum Euonymi* (U. S. P.).—Extract of Euonymus. *Dose*, gr. i–v.

**Pharmacology.**—The bark of the root of Euonymus atropurpureus (Celastrineæ) contains a bitter, amorphous substance; also, resins, euonic acid, and asparagin. The impure resin, with the bitter principle, is known commercially as **Euonymin** (dose, gr. ss–v).

It occurs in the form of a brown or greenish-brown resinous powder, of a slightly bitter taste, soluble in water, but scarcely soluble in alcohol and ether.

**Physiological Action.**—Euonymus is in small doses a tonic, increasing appetite and gastric secretions; in larger doses it is an irritant and cathartic. Euonymus is also an expectorant and diuretic, and exerts considerable influence upon the liver, as a cholagogue, resembling rhubarb in its action. The excretion of uric acid is at first increased, but subsequently diminished, by the use of euonymus.

**Therapy.**—It has been employed as a cholagogue purgative, especially in conjunction with antiperiodic treatment, in malarial poisoning. In torpid liver and chronic constipation, it aids the action of other remedies. Intestinal indigestion and jaundice are benefited by the administration of this agent. As a diuretic, it has also been employed in cases of dropsy. Euonymin is a convenient form in which to prescribe it, although the solid extract is practically the same.

**EUPATORIUM** (U. S. P.).—**Eupatorium, Thoroughwort, Boneset.**
**Dose,** gr. xv–ʒj.

*Preparations.*

*Extractum Eupatorii Fluidum* (U. S. P.).—Fluid Extract of Eupatorium. *Dose,* ♏xxx–fʒj.

*Infusum Eupatorii.*—Infusion of Eupatorium, Boneset-Tea. *Dose,* f℥ii–iv, or more.

**Pharmacology.**—The leaves and flowering tops of Eupatorium perfoliatum (Compositæ), an indigenous plant, enjoy considerable reputation in recent infusion (boneset-tea) for acute colds, rheumatism, and dysmenorrhœa. They contain **Eupatorin,** a neutral, bitter principle, with volatile oil and tannic acid.

**Therapy.**—The hot infusion (℥i–Oj) is a diaphoretic and (in large doses) emetic, acting like chamomile-flowers. The powdered dried herb is a domestic remedy for dyspepsia, but is best given in fluid extract.

The **Eupatorium purpureum,** gravel-root or trumpet-weed, an allied species, contains in its root an acrid resin and an oil, and is a stimulating diuretic. It is best given as a fluid extract of the root in dose of ♏xxx–fʒij.

**EUPHORBIUM.**—**Euphorbium.**

**Pharmacology.**—The Euphorbia resinifera (Euphorbiaceæ) is a native of Morocco, the official portion being a gum-resin, which flows from incisions in the stem and hardens in the air. The substance is yellowish, opaque, or slightly translucent, and brittle; without odor, but the powder causes much irritation and sneezing; taste acrid and burning. It is insoluble in water, only partly soluble in alcohol. It consists of an acrid resin (38 per cent.), euphorbon (22 per cent.), gum (18 per cent.), malates (12 per cent.), etc.

**Physiological Action.**—It is irritating to the skin and vesicant, owing to the acrid resin. **Euphorbon** is a drastic purgative and emetic.

**Therapy.**—It is only employed for external purposes as a rubefacient and counter-irritant. When combined with cantharides, it forms a good vesicating plaster (Janin's plaster).

The **Euphorbia corollata,** or large flowering spurge, is emetic, diaphoretic, and expectorant. The root is used (gr. xv–xx), of which a decoction may be made.

The **Euphorbis ipecacuanha,** or ipecacuanha spurge, grows along the Atlantic coast of the United States, and possesses considerable medicinal virtues. The root is the part used; it contains euphorbon, acrid resin, and possibly some glucoside. As an infusion or fluid extract, it is used as an emetic, diaphoretic, or expectorant, according to the dosage; large quantities act as a hydragogue cathartic. It has been employed in domestic practice for menstrual irregularity, dropsy, bilious colic, and catarrhal affections of the air-passages.

## EUPHORBIA PILULIFERA.—Pill-bearing Spurge, Snake-Weed.

*Preparations.*

*Decoctum Euphorbiæ Piluliferæ.*—Decoction of Euphorbia Pilulifera. *Dose,* f℥ij.

*Extractum Euphorbiæ Piluliferæ.*—Extract of Euphorbia Pilulifera. *Dose,* gr. i–ij.

*Tinctura Euphorbiæ Piluliferæ.*—Tincture of Euphorbia Pilulifera. *Dose,* ♏x–xxx.

*Extractum Euphorbiæ Piluliferæ Fluidum.*—Fluid Extract of Euphorbia Pilulifera. *Dose,* ♏xxx-fʒj.

**Pharmacology.**—Euphorbia pilulifera (Euphorbiaceæ), pill-bearing spurge, is a native of most tropical countries. The variety which has been introduced into medical practice comes from Queensland, Australia. It is an annual herbaceous plant, growing to the height of one or two feet. The fresh root is red; the dry is reddish-brown. The stalk is more or less procumbent and covered with yellowish hairs. The leaves are of a deep-green color. The fruit incloses three seeds, which bear some resemblance to a coffee-grain. The plant yields its virtues to water. The aqueous solution seems to contain tannin, but no alkaloid.

**Physiological Action.**—A strong solution of this drug has no irritant effect upon the skin. The taste is slightly astringent. It causes no redness or smarting of the tongue or buccal cavity, but is irritant to the gastric mucous membrane, and may occasion nausea or epigastric pain. No effect has been observed upon the spinal cord or muscular system. It produces no change in the calibre of the capillary vessels. The secretions are unaffected. Small doses are fatal to frogs and guinea-pigs, first accelerating and then retarding the respiration and circulation, probably acting directly upon their respective centres. It is thought to be eliminated by the liver, and is devoid of cumulative effects.

The case has been recorded of a gardener who, after handling several species of euphorbia, was suddenly attacked by burning of the conjunctiva, extending to the cheek, mouth, nose and fauces, increased lachrymation, sneezing and constant desire to urinate. The manifestations were attributed to idiosyncrasy.

**Therapy.**—Euphorbia pilulifera is chiefly of value as a remedy in spasmodic asthma, though it is not without merit in other thoracic diseases. Dr. Marsset, to whom we owe our knowledge of its physiological action, employed it in a number of cases in private practice, and reports others from the service of Dujardin-Beaumetz. It was found of signal benefit in paroxysmal asthma, whether uncomplicated or connected with chronic bronchitis and emphysema. The effect was favorable and prompt, irrespective of the origin of the disorder. This remedy has also been used with good effect in the treatment of hay asthma. Dr. Tison has found the remedy beneficial in the dyspnœa of cardiac disease. In Australia the plant is highly esteemed for its power of allaying the asthmatic paroxysm. It has likewise been found of service in chronic bronchitis, especially when occurring in old people. Dr. Marshall has prescribed it with advantage in phthisis, in which it checked the cough, promoted expectoration, and exerted some anodyne influence. The decoction is slightly tonic. The leaves have also been smoked in a pipe with satisfactory results in cases of asthma. In asthma complicated with emphysema it may very serviceably be combined with quebracho:—

| | |
|---|---|
| ℞ Tinct. euphorbiæ pilulif., | f℥ij. |
| Ext. aspidospermatis fl., q. s. ad | f℥ij. |

M. Sig.: A half to two teaspoonfuls in water, every three or four hours, for asthma, chronic bronchitis, and emphysema.

This remedy may also be beneficially combined with potassium iodide in asthma associated with chronic bronchitis.

A formula which has been recommended for asthma is as follows:—

| | |
|---|---|
| ℞ Extr. euphorb. pilulif., | gr.xxx. |
| Nitro-glycerin, | gr. $\frac{1}{10}$.. |
| Sodii iodid, | gr. xx. |
| Potass. bromid. | gr. xx. |
| Tr. lobeliæ, | ♏xx. |

M. et ft. pil. vel. capsul. no. x.

Sig.: One, two or three pills or capsules three times a day.

**EUPHORIN.—Phenylurethane.**

**Dose,** gr. iii–vj.

**Pharmacology.**—This compound, introduced by Professor Giacosa, of Turin, is an aniline product, occurring in the form of a white crystalline powder, sparingly soluble in cold water. It possesses a faint, aromatic odor, and a taste which, at first feeble, becomes warm and pungent.

**Physiological Action.**—Euphorin is antiseptic, antipyretic, and analgesic. It diminishes suppuration and reduces abnormal temperature by causing dilitation of peripheral blood-vessels.

According to Dr. C. Curtis its effect in depressing temperature manifests itself in from half an hour to two hours after administration and may continue for as long a period as ten hours. It is said to occasion no serious secondary symptoms. In some instances cyanosis has been observed, but it does not seem to cause collapse. It likewise promotes diaphoresis. Euphorin is thought to increase the excretion of urea. When given by the mouth, it is not followed by the appearance of phenol, aniline, albumin, or sugar in the urine.

**Therapy.**—Euphorin in powder has been used with advantage upon ulcerated surfaces, and has been found capable of stimulating repair in chronic lesions. Peroni and Bovera report favorably of its efficacy as a local agent in various cutaneous manifestations of syphilis, having employed it in ninety-one cases. They applied the drug in the form in powder, ointment and soap. Dr. Sansoni regards it as of service in chronic ophthalmia.

Bergerio found it serviceable in ulcerative cervicitis. He employed it in the form of powder by insufflation and as a 1 to 3 alcoholic solution.

Euphorin has been advantageously used in surgery as a substitute for iodoform. It is an efficient application in wounds, burns, scalds, bed-sores, herpes, and other cutaneous diseases, especially those of vegetable parasitic origin. In aphthous stomatitis it is equally of avail.

Professor Stiller, of Pesth, administered euphorin in different forms of neuralgia, including hemicrania and sciatica, and, in most cases, observed relief of pain. He also found it beneficial in cases of chronic articular and muscular rheumatism, and rheumatic fever. By other observers it has been successfully employed in supraorbital and intercostal neuralgia, syphilitic pains of the limbs and orchitis. In acute rheumatism euphorin has sometimes been found more efficacious than the sodium salicylate.

**EUPHRASIA.—Euphrasia, Eyebright.**

**Pharmacology.**—The Euphrasia officinalis (Scrophulariaceæ), a small herb of the White Mountains and Lake Superior region and also of Europe, with opposite leaves and spikes of blue flowers. In spite of its title, it is not official in the United States Pharmacopæia. It is astringent, containing tannin, euphrastic acid, etc. A tincture (10 per cent.) is useful in incipient catarrhal affections, hay fever (dose, ♏x every two hours), and measles.

**EUROPHEN.—Isobutyl-ortho-cresol Iodide.**

**Dose**, gr. v–x.

**Pharmacology.**—Europhen is the product of the action of iodine upon isobutylorthocresol in a solution of potassium iodide. It occurs in the form of a fine, soft, amorphous powder, of a light-yellow color, without taste, and having a faint, not unpleasant odor. The odor almost entirely disappears when the substance is made into a mixture or solution. Europhen is insoluble in water or glycerin, but dissolves in alcohol, ether, chloroform, and fixed oils. The specific gravity of europhen is half that of iodol and one-fifth that of iodoform. Europhen is easily decomposed by light and heat, and should be kept in a dark, dry, and cool place, and its solutions be made at a low temperature. The average proportion of iodine contained in europhen is 27.6 per cent. Its solutions, upon standing, throw down a precipitate, consisting of an organic iodine compound, soluble in water. Europhen contains a very small percentage of free iodine. It is incompatible with starch, metallic oxides, and the salts of mercury.

**Physiological Action.**—Europhen adheres firmly to the skin, mucous membrane, and open surfaces. When taken into the system it undergoes little change. A very small proportion of iodine is found in the urine, and the greater portion passes through the intestinal canal unchanged. Europhen is non-toxic, but by a chemical action prevents the development of pathogenetic micro-organisms in culture media.

**Therapy.**—Europhen, in the form of a powder or 10-per-cent. ointment, is an excellent dressing to ulcers of various kinds. Leg-ulcers often heal rapidly under its influence. It forms a valuable application to wounds, chancroids, open buboes, ulcerated chancres, condylomata, and ulcerated lesions of secondary and tertiary syphilis. Dr. P. J. Eichhoff used it with advantage in scrofuloderma, lupus vulgaris, and deep burns, but found it of no avail in favus or gonorrhœa. He notes, however, that excellent results were obtained from europhen in the treatment of the erosions and ulcerations of the uterine neck of such frequent occurrence in association with gonorrhœa. The powder may be applied twice daily, or a tampon charged with europhen may be introduced.

The author has used* this substance with success in the treatment of incised, contused, and lacerated wounds. In chronic ulcers of the leg and scrofulodermata, also, it exerted a beneficial influence and led to rapid cicatrization of the lesions. A lupous ulcer was decidedly improved by the application of europhen, and eventually healed. In one case of superficial epithelioma, an ointment containing 3 or 4 drachms of europhen to the ounce effected a cure. In a second case, after europhen first, and subsequently aristol, had been used without much result, a mixture of equal parts of europhen and aristol, made into an ointment, was applied with entire success. A 10-per-cent. ointment of europhen was efficient in sycosis, and the powder, dusted upon the surface of a carbuncle after the necrotic tissue had been removed, promoted the healing of the wound. Papular acne was cured by the application of an ointment containing from 1 to 2 drachms to the ounce of base. In the second stage of rosacea, a marked improvement followed the use of an alcoholic solution of europhen. The papules and pustules, together with the roughness of the skin, disappeared, and the capillary injection was diminished. An ointment was advantageous in erysipelas and in the dermatitis caused by poisoning by rhus toxicodendron. Applied as a dusting-powder, europhen proved beneficial in herpes progenitalis, herpes zoster and seborrhœa oleosa, hyperidrosis and bromidrosis. An ointment was of assistance in the treatment of alopecia circumscripta. The powder was of value in several cases of acute vesicular eczema, while the ointment rendered good service in some severe cases of chronic eczema. The writer obtained a good result in one case of psoriasis from the use of an ointment containing the equal mixture of europhen and aristol. Eichhoff observed a case of psoriasis in which europhen was inferior in its action to aristol or tar. In syphilitic ulcers the experience of the writer is confirmatory to that of Eichhoff. Dr. Seifert, of Würzburg, saw benefit in gonorrhœa of the female from the use of tampons impregnated with europhen. The same mode of treatment was effectual in endometritis with profuse discharge. Dr. Petersen, of Würzburg, reports satisfactory results from insufflation of europhen in the rhinitis of scrofulous children, attended with profuse discharge and eczema of the nares. A 10-per-cent. ointment of europhen was, in the clinic of Dr. Seifert, extremely efficacious in the treatment of both the simple and the fetid forms of atrophic rhinitis. The preparation was introduced upon cotton tampons, which were left in place for about half an hour. Secretion was promoted, crusts and obnoxious odors disappeared. From the clinic of Professor Jurasz, of Heidelberg, Dr. von Szoldrski reports a favorable influence in three cases of laryngeal tuberculosis with abundant secretion. He esteems europhen of value after operations upon the nose or larynx. Dr. Löwenstein has obtained good results with europhen in perforating ulser of the nasal septum, and in epistaxis dependent upon erosion of the septum. Dr. Nolda employed europhen successfully in three cases of suppurative inflammation of the middle ear. Dr. Nulpius reports, from the clinic of Professor Czerney, in Heidelberg, that europhen was beneficial in the treatment of wounds, osteomyelitis, and tubercular ulcers. Dr. Julius Goldschmidt, of Madeira, has, in some cases of leprosy, observed undoubted improvement by injection of a 5-per-cent. solution of europhen in oil or inunction with the same preparation. Dr. Fermandez recommends europhen in cases of accidental or operative traumatisms of the eye, in conjunctivitis and keratitis. He generally employs a 1-per-cent ointment. Europhen powder forms a convenient dressing, on account of its adhesive qualities and the fact that it does not harden into a compact cake upon the surface to which it is applied. Europhen has, as yet, been used but little as an internal medicament. Eichhoff has experimented with it hypodermically in the treatment of syphilis.

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* "Europhen: with Clinical Reference to Europhen and Europhen-Aristol." By John V. Shoemaker, A.M., M.D. See *Medical Bulletin*, September, 1892.

**EXALGINE.—Orthomethyl-Acetanilid.**

**Dose,** gr. i–vj, or from 6 to 12 grains in the course of the day.

**Pharmacology.**—This is a recent introduction into medicine from the chemical laboratory. It is a new derivative of the aromatic series, with the formula, $C_9H_{11}NO$ (or $C_6H_5,O_2H_3O$, $NCH_3$), and is one of the three methyl derivatives of acetanilid. It is in fine, acicular, or long tablet-like crystals, the first being obtained by evaporation from solution, the latter from fusion. It is sparingly soluble in cold water, more so in hot water, and extremely soluble in diluted alcohol.

Exalgine is devoid of odor or taste, and is of neutral reaction.

**Physiological Action.**—Exalgine has been brought forward by Brigonnet, of the Cochin Hospital, and has been extensively employed as an analgesic, its effect being principally manifested upon the sensory nerves. Exalgine, which is also an antiseptic, is eliminated by the urine, the amount of which it diminishes. It reduces abnormal temperature like other members of the group, and is claimed to be equally efficient in about half the dose of antipyrine.

Dr. Broadbent has reported a case in which 4-grain doses of exalgine had been ordered on account of neuralgia. The first dose relieved pain but caused some dizziness. After the lapse of some hours, feeling a slight return of the pain, the patient took 12 grains at one dose. He immediately fell prostrate, was unconscious and frothed at the mouth. The pulse was feeble and slow, the eyes closed and pupils normal. Upon recovering consciousness he complained of noises in the head, was nauseated and experienced pain in the hypogastrium. Evacuation of the stomach and stimulation were followed by recovery. In the case of a two-year-old child, to whom 5 grains of exalgine had been given in mistake, Dr. Reynery, of Havana, observed that the face and hands were of a dark blue color, there was copious vomiting of mucus, with free perspiration, rapid and feeble pulse, prominence of veins of the neck and pulsation of the carotids. The urine was dark-gray and albuminous. There was diminution of sensibility in the lower limbs. The child was revived by the use of stimulants and the symptoms gradually disappeared.

As it is soluble in diluted alcohol, it may be given in water flavored with elixir of orange or rum. The smallness of the dose gives it a decided advantage over some other preparations of this group.

**Therapy.**—In all forms of neuralgia, especially the visceral forms, exalgine has been shown to have marked control over pain. It is said to decrease the quantity of sugar excreted in diabetes mellitus. In diabetes, from 6 to 12 grains daily may be given. In facial neuralgia and myalgia, especially in anæmic, neurotic patients, good results are obtained from doses of 1 grain every four hours. Dr. Edward G. Younger has seen exalgine relieve the headache and insomnia of early melancholia, and in one severe case of epilepsy it appeared to have a marked effect in reducing the frequency of convulsions. Löwenthal administered exalgine in thirty-five cases of chorea. It exerted no specific influence, but the severity of the manifestations was reduced. He concluded that the effect of the drug was much more favorable when its administration was begun early in the disease.

Moncorvo recommends exalgine in the treatment of painful affections of children, to whom it is acceptable in taste and by whom it is well borne. He gives it in doses gradually ascending from $\frac{3}{4}$ grain to 4 grains, and considers it as equally efficacious as antipyrin in small doses.

Visceral neuralgia, dysmenorrhœa, nephritic colic and angina pectoris are relieved by the use of exalgine.

According to the observation of Dr. T. Churton, of Leeds, England, the use of exalgin is productive of some benefit in cases of exophthalmic goitre.

The solubility of exalgine in water is promoted by the addition of an equal quantity of sodium salicylate, a combination which will often be of therapeutic efficiency.

## FABIANA IMBRICATA.—Pichi.

### *Preparation.*

*Extractum Fabianæ Fluidum.*—Fluid Extract of Fabiana. *Dose*, ♏xv–xl.

**Pharmacology.**—Fabiana imbricata (Solanaceæ), or Pichi, a South American plant, is a shrub, or small tree, which grows upon high, dry hill-tops. Its branchlets are arranged in the form of plume-like sprays, which have a peculiar, light-bluish-green color, due to the large amount of bluish or greenish-gray resin, with which all its tender parts are covered.

Dr. E. Holländer has extracted a thick, brownish, crystalline mass, which proved to be a resin-acid.

Besides the resin the drug contains tannin, starch, a minute quantity of some alkaloid, probably peculiar to itself, and an abundant proportion of a glucoside analogous to esculin. The preparations are made from the leaves.

**Therapy.**—A tincture of pichi has a disagreeable, persistent, bitter taste, and unless combined with an alkali, its resin is precipitated upon the addition of water. Pichi exerts a stimulant effect upon the kidneys, but its physiological action has not been closely studied. Administration of the resin-acid to frogs caused narcosis, followed by paralysis and death. The fluid extract, when given to human subjects in medicinal doses, has no disturbing effect upon the stomach, but, on the contrary, improves the appetite.

Its therapeutical influence is chiefly manifested in affections of the genito-urinary apparatus. In enuresis nocturna, pichi has often a most beneficial action. The following combination will be found of service:—

| | |
|---|---|
| ℞ Extract. fabianæ fluid., | fʒj |
| Tinct. belladonnæ, | ♏xij. |
| Aquæ cinnamomi, | f℥iij. |

M. Sig.: A teaspoonful morning and night.

It has also been efficaciously employed in gonorrhœa, especially during the inflammatory stage.

Pichi is also beneficial in epididymitis and prostatitis.

Pichi has been given with success in jaundice and dyspepsia dependent upon an insufficient secretion of bile. The essential oil of pichi acts as a stimulant to secreting organs generally, and modifies or cures chronic purulent discharges from mucous membranes. This remedy is of service in the treatment of bronchial and intestinal catarrh. Pichi is of value in the treatment of lithiasis, or calculus of the kidney or bladder. Especially when given in combination with an alkali, it holds uric acid in solution, and it is thought that its resin dissolves the mucus which binds together the particles of a stone, leading to disintegration and facilitating expulsion. In chronic renal congestion and calculous pyelitis this drug is of service, but is believed to be contra-indicated when degeneration of renal tissues exist. Acute or chronic cystitis is benefited by the administration of pichi. Dr. Hal. C. Wyman reports very favorably upon this remedy in cystitis dependent on stricture or manipulative procedures within the uretha, and likewise in cases of lumbago and sciatica associated with the deposition of uric acid. Dr. Wyman commends the following formula:—

| | |
|---|---|
| ℞ Extract. fabianæ fluid., | f℥j. |
| Potassii nitratis, | ʒj. |
| Elix. simplicis, | f℥iij. |

M. et ft. sol.

Sig.: A teaspoonful once in two hours.

As a diuretic in cases of gravel and calculi the following combination will often prove of service:—

| | |
|---|---|
| ℞ Extr. fabianæ fl., | f℥ij. |
| Liq. potass., | fʒv. |
| Tr. nucis vom., | fʒij. |
| Elix. calisayæ, q. s. ad | f℥iv. |

M. Sig.: Teaspoonful in hot water every four or five hours.

Pichi is likewise of service in prostatic inflammation or hypertrophy, and is valuable in gonorrhœa attended by complications in which it is necessary to suspend the use of local methods.

## FEL BOVIS (U. S. P.).—Ox-Gall.

*Preparations.*

*Fel Bovis Inspissatum.*—Thickened Ox-Gall (strained and evaporated to one-half in a water-bath). *Dose*, in pill, gr. v–viij.

*Fel Bovis Purificatum* (U. S. P.).—Purified Ox-Gall (pilular consistence). *Dose*, in pill, gr. iii–vj.

**Pharmacology.**—Fresh ox-gall (from Bos taurus; class, Mammalia; order, Ruminantia) is a greenish-brown, viscid liquid, with a peculiar, nauseating odor and bitter, offensive taste. Its solution froths when shaken and saponifies fat. Its reaction is alkaline; specific gravity 1018 to 1028.

**Physiological Action and Therapy.**—Ox-gall is antiseptic and laxative, assisting in the absorption and digestion of fats in the intestinal tract and stimulating peristalsis. The local application of bile causes absorption of hypertrophies, and enlarged tonsils. It may be used internally to assist the digestion and assimilation of fatty foods or of codliver-oil, and may be given in habitual constipation with deficient assimilation.

Ox-gall has likewise been used for the purpose of expelling lumbricoid worms.

In jaundice, Harley recommends ox-gall, given in 5-grain doses, in capsules, in order that it may reach the duodenum before being acted on by the stomach. It is also of benefit, in combination with other drugs, in hepatic and intestinal affections. The following prescriptions containing ox-gall are recommended:—

| | |
|---|---|
| ℞ Fel bovis purificati, | |
| Magnesii carbonatis, | āā gr. c. |
| Ol. menth. pip., | ♏j. |

M. et ft. capsulæ no. xx.

Sig.: A capsule three or four times a day, after meals, in dyspepsia and constipation.

| | |
|---|---|
| ℞ Fel bovis purificati, | ʒj. |
| Extractum nucis vomicæ, | gr. j. |
| Aloini, | gr. j. |
| Ol. cinnamomi, | ♏j. |

M. et ft. pil. no. xx.

Sig.: Two pills between meals. Serviceable in torpor of the liver and in dyspepsia.

**Pancrobilin** is a combination of purified ox-bile and a preparation of fresh pancreas. It is best given in pills (3 grs.) after meals. Useful in duodenal dyspepsia, constipation, insufficient digestion, or assimilation of fats. A liquid pancrobilin (dose, fʒi–ij) is also furnished by Messrs. Reed & Carnrick, New York.

## FERMENTUM.—Yeast.

**Pharmacology.**—Yeast is a pale-brown, viscid, frothy liquid, with a bitter taste. Used externally in a poultice for boils and suppurating wounds or foul ulcers, and internally as an alterative tonic in furuncles and typhoid fever. Dr. M. B. Thompson has reported a series of thirty-seven cases in which yeast was used in the treatment of typhoid fever, in all of which recovery took place without relapse.

It is said to cause disappearance of sugar from the urine in diabetes.

**Dose,** f℥ss–j before meals.

**FERRUM** (U. S. P.).—**Iron.**

*Preparations.*

*Ferrum Reductum* (U. S. P.).—Reduced Iron. *Dose*, gr. i–v.

*Ferri Carbonas Saccharatus* (U. S. P.).—Saccharated Ferrous Carbonate. *Dose*, gr. ii–x.

*Massa Ferri Carbonatis* (U. S. P.).—Mass Ferrous Carbonate. Vallet's Mass (ferrous sulphate 100, sodium carbonate 100, honey 38, sugar 25, syrup and water q. s. ad 100 parts) has 42 per cent. ferrous carbonate. *Dose*, gr. iii–v.

*Mistura Ferri Composita* (U. S. P.).—Compound Iron Mixture. Griffith's Mixture (ferrous sulphate 6, myrrh 18, sugar 18, potassium carbonate 8, spirit of lavender 60, rose-water q. s. ad 1000 parts). *Dose*, fʒii–f℥ss.

*Pilulæ Ferri Carbonatis.*—Pills of Ferrous Carbonate (Blaud's Pills). *Dose*, 2 to 5 pills.

*Pilulæ Ferri Compositæ.*—Compound Iron Pills (ferrous sulphate gr. $\frac{3}{4}$, sodium carbonate gr. $\frac{3}{4}$, myrrh gr. iss, in each pill). *Dose*, 2 to 4.

*Ferri Iodidum Saccharatum* (U. S. P.).—Saccharated Ferrous Iodide. *Dose*, gr. v–xx.

*Pilulæ Ferri Iodidi* (U. S. P.).—Pills of Ferrous Iodide.* *Dose*, 2 to 4 pills.

*Syrupus Ferri Iodidi* (U. S. P.).—Syrup of Ferrous Iodide (10 per cent. ferrous iodide). *Dose*, ♏v–xxx.

*Ferri Chloridum* (U. S. P.).—Ferric Chloride. Used as a hæmostatic.

*Liquor Ferri Acetatis* (U. S. P.).—Solution of Ferric Acetate. *Dose*, ♏ij–x.

*Liquor Ferri Chloridi* (U. S. P.).—Solution of Ferric Chloride (37.8 of ferric chloride). Principally used in making the tincture. *Dose*, ♏ii–x.

*Tinctura Ferri Chloridi* (U. S. P.).—Tincture of Ferric Chloride (solution of Ferric Chloride 25, alcohol 75 parts). *Dose*, ♏v–fʒj.

*Ferri Citras* (U. S. P.).—Ferric Citrate. *Dose*, gr. v–xx.

*Liquor Ferri Citratis* (U. S. P.).—Solution of Ferric Citrate. *Dose*, ♏x–xl.

*Liquor Ferri et Ammonii Acetatis* (U. S. P.).—Solution of Iron and Ammonium Acetate. (Basham's Mixture.) *Dose*, fʒj–fʒiv.

*Vinum Ferri Citratis* (U. S. P.).—Wine of Ferric Citrate (contains iron and ammonium citrate, 4 parts; tincture sweet-orange peel, syrup and white wine). *Dose*, fʒi–iv.

*Ferri et Ammonii Citras* (U. S. P.).—Iron and Ammonium Citrate. *Dose*, gr. iii–v.

*Ferri et Quininæ Citras* (U. S. P.).—Iron and Quinine Citrate (ferric citrate 85, quinine 12 parts). *Dose*, gr. iii–v.

*Ferri et Quininæ Citras Solubilis* (U. S. P.).—Soluble Iron and Quinine Citrate. *Dose*, gr. iij–x.

*Vinum Ferri Amarum* (U. S. P.).—Bitter Wine of Iron. *Dose*, fʒi–f℥j.

*Ferri et Strychninæ Citras* (U. S. P.).—Iron and Strychnine Citrate (98 per cent. iron and ammonium citrate, 1 per cent. each of strychnine and citric acid). *Dose*, gr. i–iij.

*Syrupus Ferri, Quininæ, et Strychninæ Phosphatum* (U. S. P.).—Syrup of the Phosphates of Iron, Quinine and Strychnine) contains about gr. $\frac{1}{85}$ strychnine to each drachm. *Dose*, fʒss–fʒj.

*Ferri Lactus* (U. S. P.).—Ferrous Lactate. *Dose*, gr. ii–x.

*Syrupus Hypophosphitum cum Ferro* (U. S. P.).—Syrup of Hypophosphites with iron (ferrous lactate, 1 per cent.). *Dose*, fʒi–iv.

*Ferri Oxalas.*—Ferrous Oxalate. *Dose*, gr. ii–v.

*Ferri Oxidum Hydratum* (U. S. P.).—Ferric Hydrate. Hydrated Oxide (sesquioxide) of Iron (freshly precipitated by the addition of an excess of ammonia to the solution of the ferric sulphate and washed and strained. For use as an antidote to arsenous-acid poisoning, 20 grains to be taken for each grain of arsenic swallowed, a tablespoonful the ordinary dose as an antidote).

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* Blancard's Unchangeable Iodide of Iron Pills are especially protected by a coating of reduced iron; but they are less soluble in the gastric juice.

*Ferri Oxidum Hydratum cum Magnesia* (U. S. P.).—Ferric Hydrate with Magnesia. Antidote to arsenic.

*Ferri Iodidi Saccharatum* (U. S. P.).—Saccharated Ferrous Iodide. *Dose*, gr. v–xv.

*Tinctura Ferri Acetatis.*—Tincture of Ferric Acetate. *Dose*, ♏x—f ʒj.

*Ferri et Ammonii Sulphas* (U. S. P.).—Ferric Ammonium Sulphate. *Dose*, gr. iii–v.

*Ferri et Ammonii Tartras* (U. S. P.).—Iron and Ammonium Tartrate. Ammonio-Ferric Tartrate (about 25 per cent. ferric oxide). *Dose*, gr. v–xx.

*Ferri et Potassii Tartras* (U. S. P.).—Iron and Potassium tartrate. Potassio-Ferric Tartrate. *Dose*, gr. v–xv.

*Ferri Phosphas Solubilis* (U. S. P.).—Soluble Ferric Phosphate. *Dose*, gr. v–x.

*Ferri Pyrophosphas Solubilis* (U. S. P.).—Soluble Ferric Pyrophosphate. *Dose*, gr. ii–v.

*Ferri Hypophosphis* (U. S. P.).—Ferric Hypophosphate. *Dose*, gr. v–x.

*Ferri Valerianas* (U. S. P.).—Ferric Valerianate. *Dose*, gr. i–iij.

*Ferri Sulphas* (U. S. P.).—Ferrous Sulphate. *Dose*, gr. i–v.

*Ferri Sulphus Exsiccatus* (U. S. P.).—Dried Ferrous Sulphate. *Dose*, gr. i–ij.

*Ferri Sulphas Granulatus* (U. S. P.).—Granulated Ferrous Sulphate. *Dose*, gr. i–ij.

*Liquor Ferri Subsulphatis* (U. S. P.).—Solution of Ferric subsulphate (Monsel's Solution). *Dose*, ♏ii–x.

*Liquor Ferri Tersulphatis* (U. S. P.).—Solution of Ferric Sulphate (for making hydrated oxide of iron).

*Pilulæ Aloës et Ferri* (U. S. P.).—Pills of Aloes and Iron. *Dose*, 1 to 3 pills.

*Emplastrum Ferri* (U. S. P.).—Iron Plaster.

*Trochisci Ferri* (U. S. P.).—Troches of Iron. *Dose*, 1 to 2 troches.

*Liquor Ferri Nitratis* (U. S. P.).—Solution of Ferric Nitrate. *Dose*, ♏x–xx.

*Syrupus Ferri Bromidi.*—Syrup of Ferrous Bromide. *Dose*, ♏v–f ʒj.

*Ferri Albuminas.*—Iron Albuminate. *Dose*, gr. v–xxx.

*Ferri Arsenas.*—Iron Arsenate. *Dose*, gr. $\frac{1}{20}$–$\frac{1}{10}$.

*Ferri Ferrocyanidum.*—Ferric Ferrocyanide (Prussian Blue). *Dose*, gr. iii–vj.

*Liquor Ferri Malatis.*—Solution of Ferrous Malate. *Dose*, f ʒ ss–ij.

*Ferrum Dialysatum.*—Dialyzed Iron. (If properly made, is an easily assimilated chalybeate, free from astringency. Useful in arsenical poisoning. Does not keep well). *Dose*, ♏x–xxx.

*Mistura Ferro-Salina.*—Ferro-Saline Mixture (magnesia sulphate, ℥j; cream of tartar, ʒj; dried ferrous sulphate, gr. x; water, Oij). *Dose*, a wineglassful before breakfast each morning.

**Pharmacology.**—Iron is a metallic element, the most abundant, the most widely distributed and most useful to mankind of all the metals. In its pure state it is malleable and ductile, and the pharmacopœia directs its use, therefore, in the pure form of "fine, bright, non-elastic wire," out of which preparations should be made. Ferric salts in solution or in crystals are generally red, and the ferrous salts green; they are likely to be decolorized by drying and become white. The iron compounds are also known as chalybeates, or martial preparations; a large number are used in medicine, besides those found as constituents in natural water, iron being of common occurrence in mineral springs. The chemical tests—vegetable astringents containing tannic or gallic acid, alkalies and their carbonates, acidulous salts and mucilage of acacia—are incompatible with iron preparations.

**Physiological Action.**—As one of the proximate principles of the human organism, and playing an important part in the red blood-corpuscle (as hæmoglobin) in the nutrition of the body, iron is a necessary element in the food. When applied to the tissues, most of the salts of iron exercise an astringent effect, producing coagulation of albumin.

Some of the preparations, notably the solution of the subsulphate and the chloride, are very useful in coagulating blood and checking hæmorrhage, when locally applied. A similar astringent effect is observed in the mouth and along the alimentary canal. One of the objections to the use of most of the iron salts in medicine is the fact that they cause constipation and headache. The phosphate and pyrophosphate are exceptions to this, being non-constipating. Only a small proportion of the iron administered is assimilated, the larger proportion being discharged with the fæces, to which a black color, due to the formation of the sulphide, is imparted. The portion absorbed is largely thrown out again in the bile.

The subject of absorption and elimination of iron has been studied by Jacobi in dogs and rabbits. He has determined that not more than 5 per cent. of the iron injected into the blood is excreted in the urine and only a trace in the bile. The metal could be detected in the urine only for two or three hours after injection. About 10 per cent. of the iron thrown into a vein is removed by the bowel, liver and kidneys together, while about 50 per cent. is deposited in the liver and the remainder in the spleen, kidneys, intestinal walls and other organs. The deposit is completed within two or three hours after administration. In the course of a series of experiments upon the same subject, Gottlieb ascertained that less iron is excreted during than before the administration of the metal and that the liver contains more iron in fasting than in well-fed animals. The iron accumulated in the liver and is given up gradually to the circulation. From the blood it is removed by the epithelial cells of the bowel and also, according to Gottlieb, by those of the stomach.

Iron augments the amounts of urea and increases the frequency of micturition, the tincture of the chloride especially being credited with diuretic properties. It has a tonic influence upon the nerve-centres, but improves nutrition principally by its effect upon the circulation. While iron has little power of increasing the number of blood-corpuscles in health, this power is shown very decidedly in conditions of anæmia or hydræmia; the number of globules being rapidly increased, and the hæmoglobin of the blood gradually brought up to the healthy standard. It is supposed that the iron present in the blood-corpuscles has the property of converting oxygen into ozone, and that it thus promotes oxidation. The heart is also toned up by the effects of the iron preparations, probably owing largely to the stimulus of a better blood-supply to its walls. The stomach is stimulated by the astringent action of the iron, and the appetite and digestive capacity are improved under small doses not too long continued. Iron slightly raises the temperature of the body partly by increasing tissue waste, partly by its ozonizing effects. Some of the stronger preparations, sulphates, nitrate, iodide and chloride, are irritant, and, in large doses, poisonous. An acneform eruption sometimes results from the internal administration of iron.

**Therapy.**—The styptic qualities of iron are best shown by Monsel's solution and the chloride, in powder or solution, when applied directly to the oozing surface, as in surgical operations, post-partum hæmorrhage, hæmorrhage from the uterus after miscarriage, or cancer of that organ.

The resulting clot is very tough and dark-colored, and makes a dirty, disagreeable mass, so that, in ordinary surgical practice, iron is rarely used as a hæmostatic, when a substitute can be found. In some forms of uterine hæmorrhage, Monsel's solution may be used, diluted (1 to 3) or applied in full strength, upon a small swab to the inner surface of the uterus, if the os is previously dilated; or the vagina may be packed with absorbent cotton wet with a 5-per-cent. solution.

In epistaxis, or hæmoptysis, a spray of 1- or 2-per-cent. strength of Monsel's solution may be inhaled. Excessive hæmorrhage from leech-bites or after the extraction of teeth may be controlled by the direct application of the same agent. A solution of the subsulphate may be successfully used to restrain bleeding from hæmorrhoids. The same preparation is effective in destroying syphilitic vegetations. Fissured nipples may be cured by painting them with a mixture of 1 part Monsel's solution and 3 or 4 of glycerin. A spray of the subsulphate is beneficial in chronic ozæna. In erysipelas, the tincture is an excellent local application. The astringent preparations of iron may be used with good effect as injections in gonorrhœa and gleet. Half a drachm of the tincture to ½ pint of water, with a drachm of laudanum or 12 grains of the sulphate to the same quantity of water and laudanum, are forms in which iron may be used for this purpose. These solutions of iron, however, are open to the objection that they stain the patient's clothing. A liquid containing an astringent salt of iron is also a serviceable wash in leucorrhœa. In tonsillitis, pharyngitis, and diphtheria, the same agent may be applied directly to the throat, either pure or diluted with an equal quantity of glycerin; this application is sometimes painful, but is very efficient. The tincture of ferric chloride, though less astringent than Monsel's solution, may be used locally in the same way. In diphtheria, it can be administered internally in this form, and if, as is usually done, the preparation is suitably diluted with water, and then taken through a glass tube (so as to prevent the iron from staining and corroding the teeth), the solution will come directly in contact with the pharynx as it is swallowed, and thus combine the local and systemic effects. In such cases it is sometimes prescribed in combination, as follows :—

| | |
|---|---|
| ℞ Tincturæ ferri chloridi, . . . . . . . | f℥j. |
| Potassii chloratis, . . . . . . . . . | ʒj. |
| Syr. aurantii rubri, . . . . . . . . | f℥ij. |

M. Sig.: Half a teaspoonful to a teaspoonful every two hours in diphtheria or erysipelas.

Dr. Garretson's formula for local application in erysipelas contains the tincture of ferric chloride with the tincture of cinchona and quinine sulphate and it is applied as an astringent lotion.

These styptic preparations have also been injected into nævi and vascular tumors, to produce coagulation of their contents, but death has resulted from the escape of some of the fluid into the general circulation.

The tincture of iron is a beneficial local application in certain affections of the skin. It will in some instances relieve paræsthesia and the itching which accompanies eczema. The conjoined internal and external use of this preparation is frequently of advantage in chronic disorders attended by suppuration, as pustular eczema, impetigo, ecthyma and rupia. A combination of tincture of iron and glycerin has been serviceably applied in herpes.

The principal employment of the iron preparations is for their effect upon hæmatosis. They are pre-eminently useful in cases of anæmia, hydræmia, or chlorosis, and in many cases of debility. In chlorosis Professor Rummo injects every day into the interscapular region half a syringeful of a 1 : 10 solution of iron and ammonium citrate in distilled water. No inflammatory action is excited.

Dr. Andrew Smart, of Edinburgh, has made an interesting investigation by means of the apparatus employed for estimating the number of corpuscles contained in a specimen of blood. According to these studies the sulphate is the most valuable preparation of iron in the treatment of anæmia and chlorosis. The carbonate comes next in order of efficiency, and the syrup of the protochloride occupies the third place upon the list. A combination with arsenic increases the efficacy of the sulphate.

The preparations of iron should not be used in plethora. As they all to a greater or less degree interfere with the digestive function, checking the secretions along the alimentary tract, and frequently constipate, the state of the stomach should always be considered when prescribing iron. Where the tongue is red and dry, Fothergill has shown that iron always disagrees and should not be ordered. On the other hand, a pale, broad, and flabby tongue, marked by the impression of the teeth, is especially indicative of the demand of the system for iron. There are great differences in this respect, however, between the several preparations of iron, and new chalybeates are being constantly brought forward with the recommendation that they do not derange the digestion nor produce constipation.

One of the most efficacious of the ferruginous preparations is the tincture of the chloride, but, in addition to its disturbing effect upon the digestion, it is open to the objection that it stains and corrodes the enamel of the teeth. This action is due to the presence of free hydrochloric acid. It is customary to direct patients to largely dilute the liquid, to imbibe it through a tube and to clean the teeth, immediately after taking the medicine, with a weak alkaline solution. The virtues, without the disadvantages, of the tincture of iron seem to be possessed by a preparation devised by Dr. George W. Weld, of New York. This syrup of the chloride consists of the official tincture with the excess of acid neutralized and a certain amount of the syrup of gaultheria added for the sake of palatability. Each fluidounce contains 24 minims of the tincture. It will not injure the enamel and it does not derange the digestion.

In amenorrhœa, Blaud's pills of carbonate of iron are of great service, or the compound mixture may be used with excellent effect. Iron is of most value in simple anæmia, such as that following hæmorrhage; it is of less service where the anæmia is symptomatic and accompanies organic diseases, or blood-poisoning. In such cases it acts more quickly when given hypodermically, the ammonio-citrate dissolved in distilled water being preferred.

This salt has been successfully employed in the same manner for the relief of subacute or chronic eczema, associated with or dependent upon anæmia.

Chicandard employs the ammonio-ferrous sulphate because it is permanent and soluble.

In advocating the subcutaneous injection of iron in anæmia, Dr. Enrico Magagni contends that when introduced by the mouth it is borne by the portal system to the liver, which alone it directly influences, while upon the hæmatopoietic organs it can only exert an indirect and altogether feebler effect. When thrown under the skin it is able to act directly upon the whole blood-forming apparatus. A larger actual dose is, by this method, absorbed than when given by the way of the mouth. In consequence of the more rapid absorption a more rapid effect is obtained. As the most convenient place for injection Magagni recommends the nates, where the pain is almost imperceptible.

Dori has applied this method with success to chlorosis. As a result of a comparative study he states that the most satisfactory and rapid results were obtained from the injection of iron and ammonium citrate. The usual daily dose administered was about 1 grain.

The anæmia which results from chronic malaria is very amenable to the influence of iron. The enlarged spleen of malaria diminishes in size and malarial neuralgia is relieved. Iron is of constant service in the treatment of neuralgia, which so often depends upon a condition of anæmia:—

| | |
|---|---|
| ℞ Mass. ferri carbonatis, | gr. xxiv. |
| Extracti hyoscyami, | gr. v. |
| Podophyllotoxin, | gr. j. |
| Quininæ sulphatis, | gr. xij. |

M. et ft. pil. no. xij.
Sig.: From four to six pills a day, for neuralgia.

| | | |
|---|---|---|
| ℞ Liquor. ferri et quininæ citratis, | | |
| Liquor. potassii arsenitis, | āā | fʒ ij. |
| Elix. guaranæ, | q. s. ad | f℥ iij. |

M. Sig.: A teaspoonful three or four times a day. Use in malaria and neuralgia.

Improvement takes place in pseudo-leukæmia, or Hodgkin's disease, when iron is administered, especially in conjunction with arsenic, though the chalybeate preparations are of no utility in true leukæmia:—

| | |
|---|---|
| ℞ Ferri pyrophosphatis, | gr. xl. |
| Acidi arsenosi, | gr. j. |
| Extracti nucis vomicæ, | gr. iij. |
| Extracti belladonnæ folior. alc., | gr. ij. |

M. et ft. pil. no. xx.
Sig.: A pill three times a day.

The tincture of iron is, at times, beneficial in acute rheumatism. It is in the case of weak and pale individuals that iron is likely to be of service. In such subjects the same remedy is capable of acting, to a certain extent, as a prophylactic. It is frequently judicious in syphilis, when accompanied by evidence of profound deterioration of general nutrition, to suspend specific remedies temporarily, and place the patient upon a tonic course containing iron, which may be favorably combined with quinine, strychnine, or hoang-nan.

An efficient mixture made use of in the Skin Clinic of the Post-Graduate School of New York is thus composed :—

| | | |
|---|---|---|
| ℞ Ferri et ammon. citrat., | | ʒj. |
| Hydrarg. chlor. corr., | | gr. j. |
| Potass. iod., | | ʒij. |
| Vini ferri dulcis (Malaga), | q. s. ad | f℥iij. |

M. Sig.: Teaspoonful in water after meals.

In the so-called gonorrhœal rheumatism, iron will generally be found advantageous. Hecquet for nearly twenty years has used ferrous bromide in nervous affections, and Da Costa found it useful in chorea. This salt has also been recommended as of service in leucorrhœa, diabetes and tuberculosis.

Anæmic epileptics are benefited by iron, which may be very appropriately given in the form of the bromide and combined with potassium bromide, as :—

| | | |
|---|---|---|
| ℞ Potassii bromidi, | | ʒvj. |
| Syrupi ferri bromidi, | | fʒvj. |
| Tincturæ chiratæ, | | |
| Elixir. simplicis, | ãã | f℥j. |
| Aquæ cinnamomi, | q. s. ad | f℥vj. |

M. Dose, a tablespoonful three times a day.

Dr. Rosenthal advises subcutaneous injections of iron in nervous disorders. He prefers either the ferrum peptonatum, a syringeful of a 1 to 10 aqueous solution being given every second day, or ferrum oleatum, diluted to 1 to 20 by olive-oil and used in the same manner. Ferrum peptonatum has the advantage of greater solubility and stability. It is obtained by the decomposition of ferric chloride solution with solution of pepsin and occurs as a brownish-yellow powder.

The following combinations containing iron may be employed with good effect in gonorrhœa and syphilis :—

| | | |
|---|---|---|
| ℞ Pilulæ ferri iodidi, | | ʒj. |
| Extract. ignatiæ, | | |
| Extracti belladonnæ folior. alc., | ãã | gr. ij. |

M. et ft. pil. no. xxx.
Sig. : From four to six pills a day, in gonorrhœal rheumatism and in gleet.

| | | |
|---|---|---|
| ℞ Ferri phosphatis, | | |
| Saloli, | ãã | gr. cl. |
| Terebenæ, | | fʒij. |

M. et. ft. capsulæ no. xxx.
Sig.: Three to six capsules a day, in gonorrhæa, gonorrhœal rheumatism, and cystitis.

| | | |
|---|---|---|
| ℞ Ferri et potassii tartratis, | | ʒij. |
| Acidi arsenosi, | | gr. j. |
| Extracti cocæ, | | ʒj. |

M. et ft. pil. no. xl.
Sig.: Two pills three times a day, in syphilis.

| | | |
|---|---|---|
| ℞ Liquor. ferri malatis, | | |
| Aquæ cinnamomi, | | |
| Glycerini, | ãã | f℥j. |

M. Sig. : One to two teaspoonfuls in water three times a day, for syphilis with irritable stomach.

| | |
|---|---|
| ℞ Ferri lactatis, | gr. xl. |
| Extracti cannabis Indicæ, | gr. iss. |
| Extracti rhamni purshianæ, | gr. iij. |

M. et ft. pil. no. xij.
Sig.: A pill three or four times a day, in syphilis.

| | |
|---|---|
| ℞ Syrup. ferri iodidi, | f℥ij. |
| Extracti hoang-nan fl., | ♏l. |
| Aquæ cinnamomi, | f℥j. |

M. Sig.: A teaspoonful three times a day, for infantile syphilis.

Hysteria, especially when associated with anæmia and amenorrhœa, is improved by the systematic administration of iron.

In order to overcome the tendency which exists in neurasthenia to palpitation of the heart Zerner makes use of:—

| | |
|---|---|
| ℞ Ferri pyrophosphat, | |
| Zinci bromid., | āā gr. liv. |
| Tr. digitalis, | f℥ss. |
| Ergotin., | ʒiij. |
| Syr. aurant. flor., | f℥vj. |
| Aq. destill., | f℥iiiss. |

M. Sig.: From one to three teaspoonfuls a day.

Certain cerebral disorders depend more or less immediately upon anæmia, as some forms of puerperal mania and the insanity of lactation; chronic mania and melancholia, also, are not infrequently due to impoverishment of the blood. In all these cases the tincture of ferric chloride is a valuable remedy. The continued use of iron is very beneficial in rachitis. In this disease a combination of the ferric phosphate and calcium phosphate is especially advantageous:—

| | |
|---|---|
| ℞ Ferri phosphatis solubilis, | |
| Calcii phosphatis præcipitat., | āā ʒij. |
| Extracti nucis vomicæ, | gr. v. |
| Ol. eucalypti, | ♏v. |

M. et ft. pil. no. xl.
Sig.: Two pills three times a day.

The styptic preparations of iron, given internally, are useful in hæmorrhage. A drop or two of the nitrate or subsulphate solution, given in ice-water and frequently repeated, will usually check bleeding from the stomach; 5 to 10 drops of the tincture given upon shaved ice every half hour is recommended in the hæmorrhagic vomiting of yellow fever. The tincture of the chloride is an excellent remedy in hæmorrhage from the bowels or kidneys, and in purpura hæmorrhagica. Iron is useful, likewise, in the treatment of menorrhagia. Profuse discharges from mucous membranes, due to chronic inflammation, are restrained by the exhibition of iron, which acts as an astringent and at the same time favorably modifies the nutrition of the cells. Chronic diarrhœa and dysentery, chronic bronchitis, prostatorrhœa, gleet, and leucorrhœa are ameliorated by a chalybeate course. Dilatation of the stomach, dependent upon or connected with anæmia, is sometimes improved by the administration of iron, and, owing to its beneficial effect upon the mucous membrane, the syrup of iron is useful in the treatment of thread-worms. (A drachm of the tincture to half a pint of water is a good rectal injection when these parasites are present.) By maintaining the quality of the blood and promoting nutrition, iron is of service in phthisis and emphysema. Affections of the heart are notably improved by this remedy. In fatty degeneration, dilatation, and valvular disease, iron is demanded, in order to maintain the quality of the blood and the nutrition of the heart and to promote compensatory growth. The anæmia and indigestion of Bright's disease also receive benefit from this remedy, especially in the form of the tincture of the chloride or acetate.

Bamberger prefers to use a pill containing ⅓ grain of ferric chloride, three to six pills being given in the course of the day, or a pill of ferrous sulphate as recommended by Wiethe:—

| | |
|---|---|
| ℞ Ferri sulphatis, | |
| Sodii bicarb., | āā gr. lxxv. |
| Extr. taraxaci, | q. s. |

M. et ft. pil. no. lx.
Sig.: Three pills to be given in the morning and three in the evening.

In addition he regulates the diet and administers decoction of cinchona bark.

The nocturnal incontinence of urine in children often yields to iron: This is especially true of strumous children, for whom the syrup of the iodide is the best preparation. Iron is remedial in spermatorrhœa when that affection is the result of anæmia and relaxation. Both amenorrhœa and dysmenorrhœa are often due to impoverished blood, and, when this is the case, are best treated by iron. The menstrual irregularity, anæmia, and neurasthenia so often seen in overworked and underfed women in our great cities are conspicuously benefited by the administration of the "four chlorides," as recommended by Professor Goodell. The combination may be made as follows:—

| | |
|---|---|
| ℞ Tinct. ferri chloridi, | f ʒ iiss. |
| Hydrarg. chloridi corrosiv., | gr. ij. |
| Liquor. arseni chloridi, | f ʒ iiss. |
| Acid. hydrochlorici dilut., | f ʒ v. |
| Syrup. simplicis, | q. s. ad f ℥ iv. |

M. et ft. sol.
Sig.: Teaspoonful in water three times a day.

The vaso-motor disturbances incident to the menopause are often relieved by full doses of the tincture of iron, given several times a day. Phagedæna usually occurs in dissipated and debilitated individuals, and iron internally materially assists the action of the appropriate topical applications.

**Special Preparations.**—Among the new preparations are the solutions of ferrous malate and of dialyzed iron, both of which cause very little disturbance and rarely constipate. That the latter does exert astringent effects, however, may be inferred from the fact that Dr. W. Judkins has found it a useful remedy in the diarrhœa of childhood. Lævulose ferride is another very eligible preparation of iron, differing, in many respects, from the others. It is of alkaline reaction, agreeable to the palate and the stomach, and, it is said, can be mixed with the ordinary fluid extracts and tinctures without causing chemical union between the iron and the tannin and the formation of insoluble tannates.

Iron albuminate is an aromatic, reddish-brown, alkaline solution, which is said to be more readily assimilable than other iron-salts, less frequently the cause of gastric disorder, and is promptly assimilated, causing rapid increase in the globular richness of the blood. It may be given in milk (Dumont). Dr. J. A. Ouchterlony* finds it especially serviceable when anæmia and debility are associated with weak and irritable digestive organs. The reduced iron, or Quevenne's iron, is in such a minute state of subdivision that it is readily acted upon by the acid of the gastric juice, and generally agrees with the stomach. As it is tasteless, it may be given to children in the form of chocolates, each containing 1 grain, and thus forms an excellent tonic for anæmic and poorly-developed children. When used for its systemic effect, small doses are as efficient as large ones; it is best given when digestion is active,—about half an hour after meals.

| | |
|---|---|
| ℞ Ferri reducti, | gr. xl. |
| Sodii arsenatis, | gr. j. |
| Extract. ignatiæ, | gr. v. |
| Ext. gentianæ, | gr. xx. |

M. et ft. pil. no. xx.
Sig.: Take one three times a day, after meals, as a general tonic for an adult.

It is well to bear in mind that the prolonged administration of iron is liable to cause intestinal concretions.

The diuretic action of the tincture of the chloride is aided by saline combination. Thus, in chronic Bright's disease of the kidneys with œdema, we may give:—

| | | |
|---|---|---|
| ℞ Tinct. ferri chloridi, | | |
| Acid. phosphoric. dilut., | ãã | fʒ ij. |
| Glycerini. | | f℥ j. |
| Liq. ammonii acetatis, | q. s. ad | f℥ vj. |

M. Sig.: A tablespoonful three or four times daily in dropsy attending Bright's disease or pregnancy.

Instead of this, we may order the official solution of the acetate of iron and ammonium (Basham's mixture), or the following:—

| | |
|---|---|
| ℞ Tr. cantharidis, | fʒ j. |
| Tr. ferri chloridi, | f℥ ij. |

M. Sig.: Give twenty to thirty drops, well diluted, four times daily, to be taken through a glass tube, in gleet.

The syrup of ferrous iodide is valuable in strumous skin diseases, in conjunction with codliver-oil. The same remedy, alone or in conjunction with codliver-oil, is of undoubted efficacy in the treatment of enlarged strumous glands prior to the occurrence of caseous degeneration.

In erysipelas, comparatively large doses of the tincture of the chloride are well borne (♏xl–fʒj every two hours) and exert almost a specific effect, rapidly checking the force of the disease.

**Liquor mangano-ferri peptonatus.**—Dr. Gude has prepared a solution of iron and manganese which is well adapted to the treatment of chlorosis, anæmia, and the various secondary ailments which depend upon a deficiency of red corpuscles and hæmoglobin. This solution is a clear, dark wine-colored fluid, of an agreeable, astringent but non-metallic taste. It is given in the dose of a dessertspoonful to a tablespoonful three times a day and is acceptably administered in milk. This preparation increases the appetite and has no prejudicial effect upon digestion. It can be steadily taken for a long period.

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* Communication to Louisville Clinical Society, October 22, 1889.

**Hæmogallol.**—This substance is obtained from hæmaglobin by treatment with pyrogallol. It is a reddish-brown powder and is given in the dose of 2 to 8 grains. Hæmogallol is without taste and has no disturbing effect upon digestion.

**Hæmol.**—Hæmol is the zinc compound of hæmaglobin prepared by treatment with zinc dust. It is of a blackish-brown color and its dose is the same as that of hæmogallol.

Hæmol has but a slight taste. Both hæmogallol and hæmol can be readily administered as powders in wafer or mixed with sugar and placed dry upon the tongue. They are readily absorbed and slowly eliminated. They have been beneficially employed in chlorosis, anæmia and dependent conditions, and Dr. W. H. Porter, of New York, has given them in diabetes mellitus with reported good results. These preparations are regarded as of particular service in the anæmia which accompanies Bright's disease.

A number of metallic compounds of hæmol have been prepared and proposed as substitutes for older salts. Bromhæmol, containing 2.7 per cent. of bromide, has been experimentally used in epilepsy. Cuprohæmol, in which 2 per cent. of copper is embodied, and the dose of which is 1½ to 2 grains, is thought to be serviceable in anæmia, scrofula and tuberculosis. Ferrohæmol is a compound of iron and hæmol; its dose is 8 grains. Iodohæmol contains 1.66 per cent. of iodine. Mercuroiodohæmol is composed of 12.35 per cent. of metallic mercury and 26.68 per cent. of iodine, in addition to the hæmol. Metallic zinc in the proportion of 1.01 per cent. enters into the composition of zincohæmol, which is said to be very useful in diarrhœa and chlorosis.

**Ferratin.**—This name has been given to a fine powder, reddish-brown in color, obtained by Professor Schmiedeberg, of Strassburg, from hog's liver. Ferratin, as a rule, contains 7 per cent. of iron. Ferratin is believed to be identical in form with the iron as contained in food. It occurs in two varieties, one of which is insoluble in water, while the other, combined with sodium, is readily dissolved in water by agitation. Water containing lime forms with it an insoluble calcium ferratin. The daily dose of ferratin is from 1½ to 7 grains for children and from 15 to 20 grains for adults. Ferratin has been found valuable in the treatment of anæmia, and especially of chlorosis.

Professor Germain Sée reports that ferratin has a marked effect in increasing the appetite, that it produces no disturbance of the stomach or bowels even after prolonged administration, and that it seems to have a direct influence upon the nutrition of the tissues. The same writer states that ferratin never occasions the formation of hydrogen sulphide as a result of putrefaction in the bowel.

**Hæmoferrum.**—This is another new preparation of iron described as a natural proteid compound of iron obtained from bullock's blood. The advantages claimed for it are palatability, solubility and freedom from disturbing effect upon stomach or bowels. It is given in 3-grain doses for the relief of debility and anæmia.

**Iron quinine chloride**, a yellowish-red powder, soluble in water, alcohol and glycerin, has been used, both externally and internally, as a hæmostatic. In hæmorrhage from accessible mucous membranes a concentrated solution, or the powder itself, may be applied to the bleeding surface. Gastro-intestinal and pulmonary hæmorrhages may be treated by the internal administration of this substance. The dose is from 1½ to 3 grains.

According to Dr. Schussler, ferric ferrocyanide possesses antiperiodic virtue administered in 5-grain doses every third hour.

### **FICUS** (U. S. P.).—**Fig.**

**Pharmacology.**—The fig-tree is a native of the south of Europe and is cultivated in the southern part of the United States. The official part is the dried fruit, or rather the fleshy receptacle of Ficus carica (Urticaceæ), bearing fruit upon its inner surface. Figs are used as food, and contain 62 per cent. of sugar, with gum, fat, salts, etc. Mussi has obtained from the leaves and stems a new ferment-like principle, which he terms cradine. It is said to be more energetic than pepsin and acts either in an acid or alkaline medium. It has no influence upon carbohydrates, but its action upon fats has not yet been studied.

Confection of senna contains 12 per cent. of figs.

**Therapy.**—Figs are slightly laxative, and may be used as a dessert to correct a tendency to constipation, especially in children. The seeds act mechanically in stimulating peristalsis. Split open and heated they may be used, particularly in the mouth, to fulfill the indications of a poultice.

### **FLUORESCEIN.**

**Pharmacology.**—This is the name given to a body which results from heating together resorcin and phthalic anhydride. It is of acid reaction, and when freshly precipitated readily soluble in ether and alcohol, slightly soluble in hot water, more freely soluble in alcoholic solution. Fluorescin is of a dark-brown color, becoming green when added to water, and exhibiting a beautiful fluorescence.

Fluorescin is made by heating fluorescein with a solution of caustic soda and zinc dust. Ten grains of either substance may be dissolved in 1 ounce of water by the addition of 7½ grains of sodium bicarbonate.

**Therapy.**—Fluorescein and fluorescin are of service from their property of staining abraded corneal surfaces, by which means such lesions may be readily located. They have no effect in ulcers of the cornea or interstitial keratitis. These substances may be used also for the purpose of determining the permeability of stricture of the nasal duct. Forced into the canaliculis, if there is the least opening through the occlusion, some of the green solution will find its way into the nose.

### **FŒNICULUM** (U. S. P.).—**Fennel-Seed.**

*Preparations.*

*Oleum Fœniculi* (U. S. P.).—Oil of Fennel. *Dose*, ♏v–xv.
*Aqua Fœniculi* (U. S. P.).—Fennel-Water. *Dose*, fʒii–℥j.
*Spiritus Fœniculi.*—Spirit of Fennel. *Dose*, fʒss–j.

**Pharmacology and Therapy.**—The fruit of Fœniculum capillaceum (Umbelliferæ) contains an agreeable volatile oil (3 per cent.), which is used as a flavoring and carminative. It is an ingredient in the compound infusion of senna, compound licorice-powder, and compound spirit of juniper. Fennel-tea (infusion) is used to relieve colic in infants and in dysmenorrhœa. The oil may be added to purgative medicines for the purpose of preventing griping. Fennel has been thought to have an influence in promoting the secretion of milk.

## FORMALDEHYD.

**Pharmacology.**—Formic aldehyd or formaldehyd ($CH_2O$) is a gas obtained by the oxidation of methyl alcohol. Being readily absorbed by water a solution has been prepared to which the term formalin has been given. The solution contains 40 per cent. of formaldehyd. Formalin is a colorless fluid of pungent odor and mixes with water in all proportions. When allowed to stand the fluid gives off the vapor of formaldehyd at ordinary temperatures.

**Physiological Action.**—Formalin is an efficient bactericide. The vapor readily condenses upon objects in an apartment where the fluid is exposed. It is, consequently, excellently adapted to the disinfection of sick-rooms, hospital-wards, furniture, clothing, books, discharges, drains, etc. Formalin destroys foul odors. It penetrates fabrics without injuring them or destroying their color. Its inhibitory influence upon the growth of bacteria has enabled the investigator to fix at any stage those organisms for the purpose of study or demonstration. This property has been likewise applied to the diagnosis between the typhoid bacillus and the bacterium coli commune, which organisms exhibit a marked difference of susceptibility to the action of formaline.

Formaldehyd is comparatively non-toxic. Undiluted formalin, when applied to the animal skin, occasions necrosis without suppuration An injection equivalent to about 6 grains to the pound of body-weight was rapidly fatal to guinea-pigs, the animal becoming comatose and dying without convulsions. It reduces temperature from 2° to 4° F. It is eliminated in the urine within twenty-four hours.

**Therapy.**—Formalin has been employed in general surgery by De Buck and Vanderlinden, of Ghent. A one-half per-cent. solution was used for washing hands and instruments, cleansing the seat of operation, and for the disinfection of wounds, cavities and sinuses. These writers have obtained excellent results from its use as a wash and dressing after major operations.

It has been suggested that the peculiar necrotic effect of formalin may render it valuable in the destruction of benign or malignant growths of the skin. A $\frac{1}{2}$- to 1-per-cent. solution is recommended as a serviceable application to sweating hands and feet. It has been suggested that this agent would prove a serviceable application in psoriasis and lupus. On account of the ready diffusion of its vapors, M. Potterin asserts that formalin is an excellent antiseptic application to the skin, suitable to the treatment of diseased conditions of the hair-roots and follicles. Absorbent cotton moistened in a 2-per-cent. solution of formalin and covered with an oil-skin bandage is usually well tolerated.

In the practice of dentistry formalin may be used for the purpose of killing the nerves of carious teeth. The inhalation of a very weak spray of formalin may prove beneficial in chronic laryngitis, bronchitis, etc.

Formalin has been used in ophthamology by Dr. M. Valude. A solution of 1 to 2000 causes slight smarting when first applied to the eye, but the sensation soon vanishes. With a solution of this strength Valude has successfully treated chronic conjunctivitis and ophthalmia neonatorum, and recommends its addition to collyria in order to effect sterilization.

**Paraform.**—When heated in a watery solution formaldehyde, according to Aronsohn, is converted into a solid, white, crystalline substance, insoluble in water. This is termed paraform and is said to be an excellent intestinal antiseptic.

### FRANGULA (U. S. P.).—Frangula, Buckthorn.

*Preparations.*

*Extractum Frangulæ Fluidum* (U. S. P.).—Fluid Extract of Frangula. *Dose*, f ʒ ss–j.

*Extractum Frangulæ.*—Extract of Frangula. *Dose*, gr. iii–viij.

**Pharmacology.**—The bark of Rhamnus frangula (Rhamneæ), collected at least one year before being used. It is a European species of a plant of which this country has a valuable variety in the California buckthorn, or Cascara sagrada. (See Rhamnus Purshiana.) It contains a lemon-yellow, odorless, and tasteless glucoside, **Frangulin** (or rhamnoxanthin), insoluble in water, but soluble in alcohol or ether. The recent bark contains a gastro-intestinal irritant, which is lost or modified by age, and therefore it is directed that only bark that has been dried for a year shall be used. Old bark contains **Emodin,** probably the most valuable constituent. The fluid extract is made with diluted alcohol, and better represents the bark than the preparations made simply with water, as the decoction (1 to 16) or the extract.

Frangula communicates a deep yellow hue to the urine and fæces.

**Therapy.**—Frangula is a good laxative or purgative, resembling senna in its action. It can be used during pregnancy and is improved by the addition of a small amount of some aromatic to prevent griping.

### FRANKENIA.—Frankenia, Yerba Reuma.

**Pharmacology and Therapy.**—A California plant, the Frankenia grandiflora (Frankeniaceæ), is recommended as a mild astringent. It is best given as a fluid extract, made with diluted alcohol, in diseases of the mucous membranes, as catarrh, leucorrhœa, gonorrhœa, etc. **Dose,** ♏ x–xv.

It has also been used with reported success as a local application in chronic rhinitis and ozæna, preferably in the form of a spray.

### FRASERA.—Frasera American Columbo.

**Pharmacology and Therapy.**—The root of Frasera Walteri (Gentianeæ) contains a bitter principle, **Gentiopicrin,** and a yellow, crystallizable substance, **Gentisic acid.** It is used like gentian and other vegetable bitters. The fluid extract (alcoholic) is the best preparation. **Dose**, ♏ xxx–fʒj, several times daily, as a bitter tonic and gastric stimulant

**FUCHSIN.—Fuchsine, Rosaniline Hydrochlorate.**

**Pharmacology and Therapy.**—A derivative of aniline, of special interest from the beautiful magenta-red solution which its greenish crystals make with water. Like other preparations of this group, it may be contaminated with arsenic.

Dr. Elliot reports a case of Paget's disease in which remarkably good results were obtained by the application of an ointment containing 1½ grains of fuchsin to an ounce of lanolin and 7 drachms of rose-water. A 1-per-cent. alcoholic solution has been successfully used in some cases of traumatic erysipelas. The intra-laryngeal injection of a 2-per-cent. watery solution of boric acid saturated with fuchsin is said to be beneficial in tuberculous laryngitis. When administered internally, it colors the urine and the saliva; and also the fluids of the body, since the vision is affected (chromatopsia). It is claimed to have some influence over chronic kidney disease and that some cases of albuminuria have been arrested by it (given in doses of gr. ss–iv daily, with some vegetable extract). This remedy has likewise been administered with asserted advantage in typhus fever.

**FUCUS VESICULOSUS.—Fucus, Bladder-Wrack, Gulf-Weed.**

**Pharmacology and Therapy.**—Fucus vesiculosus is an alga, or unicellular plant, growing to immense size, forming masses of seaweed in the Atlantic Ocean, found principally in the Gulf-stream. It occurs in dried pieces of dark-brown or greenish color, with a disagreeable, fishy odor, and a mucilaginous, bitter, sea-water taste. It contains mucilage, a bitter extractive, small amounts of iodine and bromine, with chlorides, phosphates, etc. It is supposed to be alterative and to have the power of reducing obesity, probably from the observation that pigs feeding upon it in Ireland do not fatten. It has been used with some success in enlarged scrofulous glands, bronchocele, and psoriasis. The decoction (1 to 16) may be used before meals to take away the appetite for food, or if used warm it acts as an emetic. The fluid extract and solid extract are irrational preparations; the only form in which to obtain the effects of the plants is the recent decoction.

**GALANGA.—Galanga.**

**Pharmacology.**—The Alpinia officinarum (Zingiberaceæ) is a native of China, where the root is prized as a medicine. It is aromatic, resembling ginger and anise, and contains a volatile oil and an acrid resin.

Galanga is stimulating and carminative, resembling ginger or cubeb. It is an ingredient in the powder for colds or catarrhs, "catarrh snuff," and is also used in lozenges for pharyngitis and coughs.

**GALBANUM.—Galbanum.**

*Preparations.*

*Emplastrum Galbani.*—Galbanum-Plaster.

*Pilulæ Galbani Compositæ.*—Compound Galbanum Pills (containing galbanum, gr. iss; myrrh, gr. iss; asafœtida, gr. ss). *Dose*, ii–iij.

**Pharmacology.**—Galbanum is a gum-resin from Ferula galbaniflua, a native of Persia, and probably from other allied plants (Umbelliferæ). It contains a volatile oil (6 to 9 per cent.), resin (60 to 67 per cent.), and gum (19 to 22 per cent.). The resin contains sulphur. By fusion with caustic potash, galbanum produces resorcin.

**Therapy.**—As a local application, it is stimulant, and the plaster is used as a counter-irritant and resolvent over old swellings. Asafœtida may be combined with it, as in the formerly official asafœtida plaster. Internally it is an expectorant and antispasmodic. The compound pills of galbanum may be used in chronic bronchitis; also in chronic rheumatism and rheumatic affections. Some emmenagogue power has been attributed to the compound pills of galbanum.

### GALEGA:

**Dose**, ʒi–iss.

**Pharmacology and Therapy.**—Galega officinalis and galega apolinea (Leguminosæ), indigenous plants, stimulate the secretion of milk. A watery extract possesses the properties and peculiar odor of the plant. In the daily dose of 1 drachm to 1½ drachms, galega excites within a few days a notable augmentation of the milk. According to M. de la Carrière, the increase relates not only to the water, but to the globules also, as is shown by direct analysis and the gain in weight of the child. He prescribes it as follows:—

| | | |
|---|---|---|
| ℞ Extr. galegæ aquos., | | |
| Calcii lacto-phosphat., | āā | ʒ iiss. |
| Tr. fœniculi, | | f℥ iiss. |
| Syr. simpl., | | f℥ xij. |

M. Sig.: From four to eight tablespoonfuls a day.

### GALIUM.—Cleavers, Bed-straw.

**Pharmacology and Therapy.**—The whole plant of Galium aparine (Rubiaceæ), a common indigenous herb, is used in domestic practice. Galium yields its virtues to water and alcohol, is bland to the taste, and devoid of bitterness or astringency. According to Dr. Eckfeldt, it is aperient, diuretic, and alterative. It may be used in the treatment of dropsy, incontinence of urine, jaundice, icterus neonatorum, and strumous manifestations associated with inactivity of liver and kidneys. Galium may be given in the form of an infusion or a fluid extract, the dose of which is 1 or 2 fluidrachms.

### GALLA (U. S. P.).—Nutgall.

*Preparations.*

*Tinctura Gallæ* (U. S. P.).—Tincture of Nutgall (20 per cent.). *Dose*, fʒ ss–j.
*Unguentum Gallæ* (U. S. P.).—Nutgall Ointment (20 per cent.).

**Pharmacology.**—Galls are excrescences on the oak, Quercus lusitanica, variety Infectoria (Cupuliferæ), caused by the punctures and deposited ova of the gall-fly, Cynips gallæ tinctoriæ (class, Insecta; order, Hymenoptera). Galls are hard, irregularly-spherical bodies, heavy and brittle. Externally, they are dark-green or gray; internally, yellowish-gray and dark in the centre, with a central cavity. The important constituents are tannic acid (40 to 75 per cent.) and gallic acid (2 to 3 per cent.). The Aleppo galls are the best; light-colored, spongy bulbs are inferior. Their preparations are incompatible with metallic salts and generally form insoluble precipitates with alkaloids.

The powdered galls are very astringent locally to the skin and to the gastro-intestinal mucous membrane. Stockman doubts if they exert any astringent effect in the blood or by systemic action; any such action he considers as merely reflex, from the effect upon the stomach.

**Therapy.**—In the form of ointment, galls are used as an application to hæmorrhoids; a drachm of powdered opium to each ounce of nutgall ointment is a good addition for this purpose. Nutgall ointment is also a useful dressing to indolent ulcers, to eczema of the scalp after the scales have been removed, to herpes, fissured nipples, chilblains, and alopecia circumscripta. It is also serviceable in prolapse of the rectum. Grose claims that an ointment containing 1 part of powdered galls to 8 of vaseline is efficacious in extensive burns and that it restrains the tendency to subsequent cicatricial contraction.

The tincture of galls may be used, diluted with water, as a wash or gargle; but, for internal use, gallic or tannic acid are preferable. An infusion or decoction is sometimes made use of as an enema in diarrhœa and dysentery. The aromatic syrup of galls (containing galls, cinnamon, ginger, brandy, and sugar) is a pleasant astringent for children (dose, ♏xxx–ʒj).

### GARRYA FREMONTI.—California Fever-Bush, Skunk Bush.

**Pharmacology and Therapy**—Garrya Fremonti is an evergreen shrub found in the higher localities of the mountains of California. The leaves, the part used medicinally, have little odor, but are very bitter to the taste. Mr. D. J. Ross claims* to have found in the leaves a new alkaloid, which he terms Garryine. Garrya possesses tonic and antiperiodic virtues and is said to be a reliable cholagogue. Excessive doses cause buzzing in the ears. A solid and a fluid extract have been prepared. The dose of the former is ½ to 1 grain and of the latter 10 to 30 minims. Dr. Q. C. Smith, of Austin, Texas, writes that, from an experience of fifteen years, he regards this remedy as of more service than quinine in chronic or relapsing cases of malarial disease. He states that it is of value, also, in acute pulmonary inflammations.

### GAULTHERIA.—Partridge-Berry, Wintergreen, Tea-Berry.

*Preparations.*

*Oleum Gaultheriæ* (U. S. P.).—Oil of Gaultheria. *Dose*, ♏ii–xx.

*Spiritus Gaultheriæ* (U. S. P.).—Spirit of Gaultheria (5 per cent. in alcohol). For flavoring.

*Oleum Betulæ Volatile* (U. S. P.).—Volatile Oil of Betula. Oil of sweet-birch (a volatile oil obtained from the bark of sweet-birch, identical with methyl salicylate and nearly identical with oil of gaultheria). *Dose*, ♏i–v.

*Methyl Salicylas* (U. S. P.).—Methyl Salicylate. Artificial (or synthetic) oil of wintergreen. *Dose*, ♏j–v.

**Pharmacology.**—The Gaultheria procumbens (Ericaceæ) is a small plant growing in the woods in North America; the leaves were formerly official; they contain a **volatile oil, Arbutin, Urson, Ericolin, tannic acid,** etc. The taste is aromatic, slightly bitter and astringent; the flavor is agreeable. The volatile oil consists principally of **Gaultherilene** and methyl salicylate (90 per cent.), which yields a pure salicylic acid. The oil of sweet-birch is frequently sold for oil of gaultheria, with which it is nearly identical. It is sometimes fraudulently adulterated with oil of sassafras.

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* *American Journal of Pharmacy*, 1877.

**Therapy.**—The oil of gaultheria is antiseptic and antipyretic. It may be used in doses of ♏x–xx in articular rheumatism as a substitute for salicylic acid. It is efficacious, but is not as well tolerated as sodium salicylate on account of its local irritant properties. Dr. John A. Wyeth, of New York, regards the oil of gaultheria as a serviceable remedy in the treatment of acute gonorrhœa. He administers it in 6-drop doses three times a day.

The decoction of the leaves or a fluid extract may be used in bowel disorders as an astringent. The infusion is in some parts of the country used as a substitute for tea at the table. It is also used as a galactagogue and emmenagogue. It is a good addition to liniments for rheumatic pains and swollen joints. A combination of equal parts of oil of wintergreen and olive-oil is a good application in such conditions.

Excessive doses of oil of gaultheria give rise to violent gastro-enteritis, followed by convulsions, coma and death. Half an ounce has caused death; in another case recovery occurred after ingestion of the same quantity.

**Salicylamide.**—This substance is made by treating oil of gaultheria with saturated ammonia water. It has also been prepared from artificial oil of wintergreen. Pure salicylamide occurs in the form of colorless and transparent crystals. It is without taste and is moderately soluble in water. It is claimed to possess the virtues of salicylic acid with greater analgesic power. Salicylamide has been given in doses of 3 to 5 grains repeated several times during the day.

### GELSEMIUM (U. S. P.).—Gelsemium, Yellow Jasmine.

**Dose**, gr. ii–xx.

*Preparations.*

*Extractum Gelsemii Fluidum* (U. S. P.).—Fluid Extract of Gelsemium. *Dose*, ♏ii–x.

*Tinctura Gelsemii* (U. S. P.).—Tincture of Gelsemium (15 per cent.). *Dose*, ♏v–xx.

*Gelsemina.*—Gelsemine. The active principle. *Dose*, gr. $\frac{1}{200}$–$\frac{1}{60}$.

**Pharmacology.**—The rhizome and roots of Gelsemium sempervirens (Loganiaceæ), a climbing-plant, growing in the southern portion of the United States, contains a volatile oil, resin, gelseminic acid, etc.

Two bases have been extracted from gelsemium. Gelsemine is a crystallizable alkaloid. Gelseminine is amorphous, of a pale, grayish-brown color, bitter to the taste, readily soluble in alcohol, ether or chloroform and but slightly soluble in water.

**Physiological Action.**—It has no special local action beyond slight sedative influence or astringency. Internally, it is a powerful motor depressant and sedative, motion being affected before sensibility in warm-blooded animals. It acts especially upon the centres in the spinal cord and medulla. Small doses occasion injection of the conjunctivæ, pain in the eyelids, contraction of pupils (if locally applied or in very large doses it may cause dilatation), with drooping of the upper lid, or, more decidedly, vertigo and confusion of vision. Larger doses exert a paralyzing influence upon the spinal cord; the power of voluntary movement is progressively lost, numbness and staggering gait being observed as preliminary symptoms. Reflex irritability is lowered, the pupils dilate, and the sensory columns of the cord become paralyzed. No brain symptoms are produced directly, but the cerebral functions may be disturbed by the accumulation of carbonic acid in the blood, the result of paralysis of muscles of respiration. Death results from asphyxia. In animals convulsions may appear. Little effect is observed upon the heart directly; the pulse-rate is lessened by lowering the excitability of the excito-motor ganglia of the heart (Ott) and the arterial pressure by diminution of vaso-motor tonus. It produces a decided lowering of the bodily temperature and is diaphoretic. There are languor, muscular depression, and prostration.

**Poisoning.**—In cases suffering with toxic symptoms from an overdose, diffusible stimulants, hot drinks, friction to the surface of the body, and artificial respiration are useful, after evacuation of the contents of the stomach. Hypodermic injections of morphine and atropine are antagonistic to gelsemium. Tannic acid and caustic alkalies and their carbonates are chemically incompatible. In case of poisoning with gelsemium, the stomach should be promptly emptied by an emetic or the stomach-pump. External heat should then be employed, together with cardiac and respiratory stimulants, as digitalis, ammonia, atropine, and strychnine.

The smallest quantity of gelsemium which is known to have caused death is a teaspoonful of the fluid extract. In one fatal case Professor Wormley estimated that the quantity of fluid extract taken was equivalent to $\frac{1}{6}$ grain of gelsemine.

**Therapy.**—Gelsemium may be given to allay excessive nervous irritability, as in neuralgia, ovaralgia, tic douloureux, and in some cases of myalgia. Gelsemium is frequently beneficial in lumbago. It will often allay the pain of dental neuralgia. In facial neuralgia, comparatively large doses of the tincture (♏x–xx), every two hours, are well borne. It has also been proposed as a remedy for tetanus, and might be useful in hydrophobia to control the spasms.

Dr. John B. Read treated a case of tetanus successfully by the administration of 40 drops of the fluid extract every second hour until the symptoms began to ameliorate, when the dose was reduced by one-half and continued for several days.

Ringer has found the tincture, in 10-minim doses thrice daily, beneficial in some cases of Menière's disease. The same preparation, in 5-drop doses every quarter of an hour, will sometimes arrest an attack of bilious colic. In the spasmodic stage of whooping-cough, in asthma, laryngismus stridulus, and torticollis, gelsemium has given relief. It is of service in migraine and in headache from eye-strain, in maniacal paroxysms, mania a potu, and insomnia. Certain fevers, notably cerebro-spinal and remittent, are benefited by the administration of gelsemium. When acute eczema is accompanied by considerable constitutional reaction gelsemium may be given with marked advantage. This agent, likewise, especially when administered at bed-time, relieves the itching of eczema. It allays the pain of dysmenorrhœa, favors dilatation of a rigid os in labor, and quells after-pains. It is of considerable service in the treatment of hæmoptysis. It is used in small doses as an antispasmodic in coughs, and in pneumonia and pleurisy. A full dose of gelsemium may prove successful in aborting an acute coryza. It is safer, on account of possible idiosyncrasy, to begin with very small doses of the tincture or extract, and gradually increase until slight drooping of the eyelid shows the beginning of full physiological effect. Gelsemium may be employed locally in the treatment of prurigo in the form of fluid extract, diluted.

In the dermatitis caused by Rhus radicans Dr. Edson has successfully used a lotion containing 2 drachms of the fluid extract of gelsemium to 4 ounces of water, a small quantity of carbolic acid and glycerin being also contained in the mixture. It has been also used as a mydriatic in eye practice.

**GENTIANA** (U. S. P.).—**Gentian.**
**Dose,** gr. viii–xxx.

*Preparations.*

*Extractum Gentianæ* (U. S. P.).—Extract of Gentian. *Dose*, gr. iii–xv.

*Extractum Gentianæ Fluidum* (U. S. P.).—Fluid Extract of Gentian. *Dose*, ♏xxx–fʒj.

*Tinctura Gentianæ Composita* (U. S. P.).—Compound Tincture of Gentian (contains gentian 10, bitter orange-peel 4, cardamom 10, alcohol and water, each q. s. ad 100 parts). *Dose*, fʒi–iv.

*Elixir Gentianæ Ferratum.*—Ferrated Elixir of Gentian. *Dose*, fʒi–iv.

*Elixir Gentianæ et Ferri Phosphatis* of the National Formulary contains ferric phosphate, gr. viij; gentian, gr. xvj; in each f℥j. *Dose*, fʒi–iv.

*Infusum Gentianæ Compositum.*—Compound Infusion of Gentian (contains gentian 10, bitter orange-peel 2.50, coriander 2.50, in diluted alcohol, 1 to 10, q. s. ad 320 parts). *Dose*, f℥ss–j.

**Pharmacology.**—Gentian is the root of Gentiana lutea (Gentianeæ), a native of Europe. Many species are indigenous, as the Gentiana puberula, Gentiana saponaria, Gentiana Andrewsii, and the beautiful Gentiana crinita, which differ in therapeutical effects only in degree from the official gentian, and may be employed for like purposes. Both water and alcohol dissolve the active principle, which is very bitter, and appears to be a glucoside, **Gentiopicrin**, combined with **gentisic acid,** a coloring ingredient. There is no tannin present; although the preparations are darkened by most of the iron salts (the citro-chloride is excepted), due to a change in this coloring matter, probably. Of the American varieties a decoction or infusion may be used, although a fluid extract would better represent the drug.

**Physiological Action.**—Gentian is a simple bitter, with little, if any astringency, and has the same physiological action as others of this class. When combined with an alkali its local effects upon the stomach are much increased. From experiments upon dogs Dr. P. Terray concludes that gentian is the most powerful stimulant to the automatic movements of the stomach.

Gentian has been thought to exert a slight stimulant effect upon the liver. The chalybeates are synergistic, with reference to general tonic effects. It enjoys a reputation as a succedaneum for cinchona, as an antipyretic and antiperiodic, though to a less marked degree; its actions have not been as much studied as those of the latter. No toxic effects have been noted.

**Therapy.**—As a stomachic tonic, the preparations of gentian are deservedly esteemed in cases of weak stomach during convalescence, catarrhal gastric disorder in infants, or ordinary atonic dyspepsia:—

℞ Sodii bicarb., . . . . . . . . . . . . ʒiv.
Infusi gentianæ comp., . . . . . . . . . . f℥vj.
M. Sig.: A tablespoonful or two half an hour before meals.

It may be given with advantage in cases of atony of the stomach with a moderate amount of dilatation. The compound infusion of gentian is a good vehicle for administration of potassium iodide in cases where its tonic effects would be useful. Combinations of gentian and iron are numerous, but none are used so much as the ferrated tincture of gentian (not official):—

℞ Tincturæ gentianæ, . . . . . . . . . f℥iv.
Tincturæ ferri citro-chlorid. (N. F.), . . . . . f℥j.
M. Sig.: Two teaspoonfuls after each meal.

The gentian mixture official in the British Pharmacopœia is, according to Whitla, excelled by few remedies in the treatment of the vomiting of pregnancy, especially when combined with a mineral acid.

The infusion, or decoction, is useful as a stomachic in gastric disorders associated with gout or malarial fever, or the compound tincture may be used where the alcohol is not objectionable:—

℞ Tincturæ cinchonæ,
Tr. cardamom. comp., . . . . . . . . āā f℥j.
Tr. gentianæ comp., . . . . . . . . . . f℥ij.
M. Sig.: A dessertspoonful to a tablespoonful in malarial dyspepsia and debility with loss of appetite.

**Gentiana Quinquefolia.**—The five-flowered gentian is common in the United States. The whole plant is bitter, and may be given in infusion, but a fluid extract would be better (dose, ♏v–xxx). It may be used for the same purpose as the preceding.

**GERANIUM*** (U. S. P.).— **Geranium, Cranesbill.**
**Dose, gr. xv–ʒj.**

*Preparations.*

*Extractum Geranii Fluidum* (U. S. P.).—Fluid Extract of Geranium. *Dose*, ♏xxx–fʒj.

*Extractum Geranii.*—Extract of Geranium. *Dose*, gr. i–v.

**Pharmacology.**—An indigenous plant, found in the woods from Canada to Florida, of which the rhizome only is official. The spotted geranium, as it is called, or Geranium maculatum (Geraniaceæ), contains tannic (13 to 17 per cent.) and gallic acids, which are its most important constituents, besides some resin, gum, starch, pectin, coloring matter, etc. According to the analyses of Trimble and Peacock, gallic acid does not exist in the plant, but is easily found in the rhizome after drying, and results from the easily decomposable tannin. A crystalline vegetable principle has also been found in geranium by Dr. Edward Staples.

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* See paper by author in the *Atlanta Medical and Surgical Journal*, October 1889.

As geranium imparts its virtues to both water and alcohol, it may be used in decoction and tincture, as well as in the official fluid extract, which is made with dilute alcohol.

**Physiological Action and Therapy.**—Geranium improves the appetite and digestion and promotes nutrition. As it is decidedly astringent, the drug may be used, in fine powder, as a styptic in hæmorrhages after extraction of a tooth, epistaxis, etc. Its astringency renders it an excellent hæmostatic. The writer has obtained good results from the local application of the fluid extract, diluted with 3 or 4 parts of water, in buccal ulcer, fissure of the anus, and metrorrhagia. The same treatment promptly arrested a hæmorrhage from the urethra and at the same time cured a rebellious gleet which had been in existence for two years.

Geranium makes a useful throat- and mouth-wash :—

℞ Potassii chloratis, . . . . . . . . . ʒij.
Ext. geranii fl., . . . . . . . . . . fʒvj.
Glycerini, . . . . . . . . . . . f℥j.
Aquæ rosæ, . . . . . . . . q. s. ad f℥vj.
M. Sig.: Add a tablespoonful to two tablespoonfuls or more of water, and use as a gargle.

In catarrhal inflammations, as an injection in gonorrhœa, gleet, and leucorrhœa, the decoction is more serviceable, according to Prof. L. Johnson, than a simple solution of tannin, doubtless from the fact that there is present mucilaginous material, which acts as a demulcent. The fluid extract is useful internally in diarrhœa. In infantile diarrhœa, the decoction may be very acceptably administered in milk, which covers its taste. It is a valuable remedy in the early stages of phthisis, diminishing cough and expectoration, reducing the fever and pulse-rate, checking night-sweats and hæmoptysis. Under its use the appetite improves and the patient gains in weight. In a rapid case of phthisis, accompanied by profuse night-sweats, complete loss of appetite, and a severe, harassing cough, marked temporary relief was obtained by the following prescription :—

℞ Ol. menth. pip., . . . . . . . . . ♏xx.
Ext. geranii fl., . . . . . . . . . f℥iss.
Vini Portensis, . . . . . . . . . f℥j.
M. Sig.: Teaspoonful every third hour.

Geranium is mild and unirritating, and especially suited to the later stages of diarrhœa and dysentery in children. It has also been employed in internal hæmorrhages, with good results :—

## GEUM.—Avens.

### *Preparation.*

*Extractum Gei Fluidum.*—Fluid Extract of Avens. *Dose*, ♏xx–fʒj.

**Pharmacology.**—Two species of Geum (Rosaceæ) are used in medicine,—the Geum urbanum, or European avens, and the Geum rivale, or water avens, a native of North America. In each, the root is the part possessing medicinal properties. Geum contains a bitter principle called **Gein** by Buchner, a little volatile oil, a large proportion of tannic acid (10 to 40 per cent.). A recent infusion or decoction would best represent the physiological action of geum, though a fluid extract made with dilute alcohol is also used.

**Therapy.**—Avens is tonic and astringent. It is chiefly useful in relaxation of mucous membranes. An infusion made with boiling water is given for diarrhœa.

**GILLENIA.—Gillenia, American Ipecacuanha.**
**Dose,** gr. v–xxx.

*Preparation.*

*Extractum Gilleniæ* (*Trifoliatæ*) *Fluidum.*—Fluid Extract of Gillenia (Trifoliata). *Dose,* ♏v–xxx.

**Pharmacology.**—The Gillenia trifoliata, or Indian physic, and Gillenia stipulaceæ, which is a species closely resembling it, were formerly official, but have been dropped from the pharmacopœia, as they are very inefficient substitutes for ipecacuanha. They belong to the natural order Rosaceæ, and are indigenous to this country, growing from Canada to Georgia. The part used is the root, which contains **Gillenin,** a peculiar bitter principle, to which its therapeutic properties are due. It also contains tannic acid, gum, resin, starch, etc.

**Physiological Action and Therapy.**—Gillenia is an active emetic, and in small doses is thought to resemble ipecacuanha as a tonic and cholagogue, and is also diaphoretic and expectorant.

It has been used as a substitute for ipecacuanha, as an emetic, stomachic tonic, and diaphoretic, and in domestic practice in dyspepsia, etc.

**GLYCERINUM** (U. S. P.).—**Glycerin.**
**Dose,** fʒi–iv.

*Preparations.*

*Glyceritum Amyli* (U. S. P.).—Glycerite of Starch (glycerin 80, starch 10 parts). For external use.

*Glyceritum Vitelli* (U. S. P.).—Glycerite of Yelk of Egg (glycerin 55, egg-yelk 45 parts). For external use.

*Glyceritum Acidi Tannici* (U. S. P.).—Glycerite of Tannic Acid (20 per cent). For external use.

*Glycerolum Pepsini.*—Glycerole of Pepsin (♏j = saccharated pepsin, gr. ij). *Dose,* ♏ii–x.

*Glyceritum Pepsini Vitulini.*—Glycerite of Calf-Pepsin. *Dose,* ♏xxx–fʒj.

*Glyceritum Boroglycerini* (U. S. P.).—Glycerite of Boroglycerin. Solution of Boroglyceride.

*Suppositoria Glycerini* (U. S. P.).—Suppositories of Glycerin.

*Glyceritum Acidi Carbolici* (U. S. P.).—Glycerite of Carbolic Acid.

*Glyceritum Hydrastis* (U. S. P.).—Glycerite of Hydrastis.

*Spiritus-Glonoini* (U. S. P.).—Spirit of Glonoin (spirit of nitro-glycerin). *Dose,* ♏j.

Glycerin is also a constituent in several extracts, fluid extracts, pill masses, mucilage of tragacanth, solution of pepsin, and other pharmacopœial preparations.

**Pharmacology.**—Official glycerin is a liquid obtained by the decomposition of fats or fixed oils, and containing not less than 95 per cent. of absolute glycerin. In the process for making lead plaster, the olive-oil, being decomposed by the lead oxide, yields lead oleate and free glycerin. It is also produced in the ordinary process of soap-making, being a constituent of the waste, from which it is now recovered in large quantities for commercial purposes. A purer glycerin is obtained by decomposing fats by steam, or superheated water, and distillation. A superior article is made from vegetable fats by Messrs. Proctor & Gamble, of Cincinnati, which is best adapted for medical use. Pure glycerin is a trihydric alcohol, is clean and colorless, resembling syrup, oily to the touch, without odor, very sweet, slightly warm to the taste, neutral in reaction, hygroscopic, soluble in all proportions in water or alcohol, and insoluble in ether, chloroform, benzole, or fixed oils. Under certain conditions it becomes a mass of dense, brilliant crystals, but may be cooled to — 40° C. without congealing, only becoming more viscid. Treated with strong nitric acid, it forms glonoin, or nitro-glycerin,—a substance of powerful explosive properties.

**Physiological Action.**—As it has an affinity for water, glycerin absorbs the latter from mucous surfaces and excites secretion. It is irritating in its concentrated state to both skin and mucous membrane, being entirely different in its effects from oils or fats, although, when diluted, it keeps the skin moist and prevents cracking or chapping. Glycerin is absorbed by the skin and passes into the blood. It has very little effect upon the stomach. A certain amount is absorbed, with the effect of increasing nutrition and improving the appetite; it is slightly laxative, and is said to lessen the excretion of urea, though, according to the experiments of Lewin, it exerts no influence upon the quantity of urea eliminated. Large doses have produced hæmoglobinuria, owing to some action, as yet unexplained, upon the blood. In these cases the urine, according to Fuchsinger, contains the coloring matter of the blood but no free corpuscles.

In the case of a man who was accustomed to taking 3 ounces of glycerin daily, but who used no alcoholic liquor, extreme cerebral excitement was produced, according to the statement of Constantin Paul.

Glycerin is considered antiseptic, yet Koch found that it did not destroy spores nor the activity of formed ferments, although a solution in water (1 to 3) arrests the action of some enzymes (pepsin, ptyalin, emulsin), and a stronger solution (1 to 2) prevents the action of others (myrosin, diastase, invertin), but preserves their activity unimpaired, and is used to preserve them (Wernitz). Glycerin is destructive to parasites, intestinal and external. It increases the action of codliver-oil, and is a solvent for some of the alkaloids, though not for others. Owing to its sweetness, it has been used as a substitute for sugar in the diet of diabetics, though saccharin has now largely taken its place. According to the clinical observations of Pavy, glycerin increases polyuria, and he therefore opposes its use as a substitute for sugar. It seems to augment considerably the quantity of glycogen contained in the liver, though it probably prevents the transformation of glycogen into sugar.

Glycerin can be combined with admirable effect as follows:—

℞ Glycerini,
Liquor. calcis,
Aquæ rosæ, . . . . . . . . . . āā f℥ij.
M. For excoriations, erythema, superficial burns, and scalds.

℞ Glycerini,
Aquæ hamamelidis dest.,
Aquæ rosæ, . . . . . . . . . . . āā f℥ij.
M. Use on chapped face and hands, sore nipples, and hæmorrhoids.

℞ Glycerini,
Aquæ hamamelidis dest., . . . . . . . āā f℥iij.
Bismuth. subnit. vel sodii bicarbonatis, . . . . ʒij.
Acidi carbolici, . . . . . . . . . . . ♏x.
M. For erythematous or vesicular eczema, burns, and seborrhœa, especially around the axilla and genital organs.

℞ Glycerini,
Acidi lactici,
Aquæ rosæ, . . . . . . . . . . . āā f℥ss.
M. For freckles and other pigmentations of the skin.

℞ Glycerini, . . . . . . . . . . . . f℥v.
Creosoti, . . . . . . . . . . . . . fʒj.
Ol. menth. pip., . . . . . . . . . . . ♏x.
M. Valuable for catarrh, pharyngitis, and laryngitis, in the form of a spray. It can be mopped on the skin or sprayed over the surface for pruritus, eczema, and urticaria.

**Therapy.**—Diluted with 3 parts of rose-water, glycerin is a good application to the hands and lips to prevent chapping during cold weather. Glyconin is also used for this purpose. The same mixture is one of those employed in ichthyosis, after a warm-water, hot-air, or vapor bath, in order to protect the diseased area and aid in maintaining its nutrition. In more concentrated form it has been used with success in pityriasis, pruritus, acne, eczema, fissured nipples, or acute coryza, applied with a brush or spray. In combination with collodion (½ per cent.) it forms collodium elasticum, which is less painful than pure collodion, and is a good protective for fissures and abrasions. The daily application of glycerin is capable of causing a steady reduction in the size of hypertrophied tonsils. The glycerite of tannic or of gallic acid is a useful astringent as an application for sore throat, relaxation of mucous membrane, and upon tampons to the cervix uteri for leucorrhœa. A pledget of absorbent cotton, saturated in glycerin, is an excellent application, also, in congestion of the womb, as, on account of its affinity with water, it provokes an abundant serous transudation. The glyceritum vitelli is used as a vehicle for chloroform or heavy powders. Glycerin alone, or with some astringent or sedative, is useful in preventing bed-sores. Injected into the bowels, it is a mild enema, and in small quantities is efficient in evacuating the lower bowel, and may be introduced in the form of suppositories.

In obstruction by fæcal impaction, the injection of several ounces into the colon, through a long tube, was successful in the hands of Dr. Edward Mayer, of Wilkesbarre, Pa., in saving life after failure of all ordinary means of relief. Glycerin administered by the mouth has a peculiarly soothing effect upon inflamed and painful hæmorrhoids. Equal parts of glycerin and distilled water may be used as an application to keep the tongue moist in typhoid and other fevers; and a dilute solution may be sipped to moisten the throat during an attack of tonsillitis or pharyngitis, although the direct application by spray or brush should not be omitted. The red, dry, and glazed mouth of advanced phthisis is moistened by the use of a wash of glycerin and water. Reflex cough is often allayed by the application of glycerin to the fauces, and, administered internally in drachm doses, the same agent may prove of advantage in the cough of phthisis. It may be given to infants as a laxative in combination with oil. Administered alone, it has been used for the same purposes as codliver-oil, but is less efficient, although possessing some nutritive properties. It is the best remedy in cases of trichiniasis, administered in tablespoonful doses, as successfully used by Dr. James M. Barton; and is used as a laxative in cases of piles. Some forms of indigestion are improved by its administration after meals; and it is the best solvent and preservative for pepsin, either from the pig or the calf, the latter having been introduced by Dr. Woodbury as the special digestive ferment for infants or adults upon a milk diet. In acidity of the stomach and flatulence, glycerin in drachm doses two or three times a day is beneficial. It is often extremely useful in improving the appetite. Dr. J. A. Pollard esteems glycerin as of value in preventing stomach trouble during convalescence from debilitating diseases. He claims also that it has considerable power to control the vomiting of pregnancy. Ferrand regards glycerin as a valuable remedy in biliary lithiasis and as a powerful cholagogue, capable of affording relief in hepatic colic. In 5 or 6 drachm doses it terminates the attack. In 1 or 2 drachm doses, taken every day in a little alkaline water, it prevents fresh attacks. Large doses have also been given with advantage in nephrolithiasis. According to the experiments of A. Hermann, its action is mechanical and depends upon its power to abstract water from tissues.

Glycerin given in the form of suppository is often serviceable in relieving and overcoming constipation, especially when the lower bowel is inactive.

Professor Remington recommends as the best formula for glycerin suppositories: 40 grains of sodium cabonate, 80 grains of stearic acid and 1,080 grains of glycerin. The sodium carbonate is dissolved in the glycerin, the stearic acid added and the mixture is carefully heated upon a water-bath until effervescence ceases. The solution is then poured into a suppository mould to make 12 suppositories.

Griffith has employed it with marked effect in the treatment of constipation. An enema of glycerin and infusion of flaxseed (1 to 4) allays tenesmus in cases of acute dysentery (Bartholow).

The injection, under strict antiseptic precautions, of about 5 ounces of glycerin into the womb has been successfully practised in order to excite premature delivery. The tube of the syringe is introduced as far back as possible, between the wall of the uterus and the membranes. According to Pelzer from an ounce to an ounce and a half is sufficient to accomplish the purpose. In the experience of Dr. Embden this practice is not without danger and is liable to cause thrombosis or decomposition of the blood. He thinks also that it may lead to the introduction of air into the circulation.

Semmola asserts that glycerin has an antipyretic action in acute infectious diseases, in which he administers it as follows :—

| | |
|---|---|
| ℞ Glycerin. pur. | f℥ij. |
| Acidi tartarici vel citrici, | fʒj¼. |
| Aquæ, | f℥xix. |

M. Sig.: An ounce and a half to be taken every hour or half that quantity every half hour.

The glycerite of starch is a bland material, which can be impregnated with various medicaments, astringents, etc., for application to the eye or to the skin. Glycerin is a good vehicle for alkaloids, and it is thus used in various diseases of the ear, in abnormal dryness of the external auditory canal, and impaction of cerumen.

**Glycerita.**—The pharmacopœial class of glycerites includes the glycerite of carbolic acid, tannic acid, starch, boroglycerin, hydrastis and yelk of egg. Various other medicinal combinations may be made extemporaneously.

**Glycerite of Bismuth Borate** is recommended by Keyser as a good remedy in phlyctenular and scrofulous conjunctivitis.

The urine of persons using glycerin reduces copper in Fehling's test, and is liable to lead to error, being mistaken for glycosuria. This is not due directly to the presence of glycerin, but to a decomposition product. Unna has devised a preparation termed casein ointment which may be noticed in this place. It consists of 14 parts of casein, about ½ part of potassium and sodium hydroxide, 7 parts of glycerin, 21 parts of vaselin, 1 part of salicylic or boric acid and about 56 parts of water. It is a thick, white emulsion, which soon dries upon the skin and has been used in affections of the skin accompanied by itching. Various drugs may be incorporated with the ointment.

## GLYCYRRHIZA (U. S. P.).—Glycyrrhiza, Liquorice-Root.

**Dose**, gr. v–ʒss, in powder.

### *Preparations.*

*Extractum Glycyrrhizæ* (U. S. P.).—Extract of Glycyrrhiza (commercial).

*Extractum Glycyrrhizæ Purum* (U. S. P.).—Pure Extract of Glycyrrhiza. *Dose*, gr. v–ʒj.

*Extractum Glycyrrhizæ Fluidum* (U. S. P.).—Fluid Extract of Glycyrrhiza (made with aqua ammonia and alcohol). *Dose*, ♏xx–fʒj.

*Mistura Glycyrrhizæ Composita* (U. S. P.).—Compound Mixture of Glycyrrhiza. Brown Mixture (pure extract 3, paregoric 12, antimonial wine 6, spirit of nitrous ether 3, in sugar, acacia and water. *Dose*, f℥ss.

*Trochisci Glycyrrhizæ et Opii* (U. S. P.).—Wistar's Cough Lozenges (extract liquorice; pulv. opium, gr. $\frac{1}{20}$ in each, with ol. anise, sugar, and acacia). *Dose*, j or ij.

*Pulvis Glycyrrhizæ Compositus* (U. S. P.).—Compound Liquorice-Powder (senna, liquorice-root, powd.; oil of fennel, washed sulphur, sugar). *Dose*, fʒi–ij.

*Glycyrrhizinum Ammoniatum* (U. S. P.).—Ammoniated Glycyrrhizin (for flavoring).

*Infusum Lini Compositum* (Ph., 1870).—Compound Infusion of Flaxseed (contains flaxseed, ℥ss; liquorice-root, contused, ʒij, in a pint). *Dose, ad lib.*

**Pharmacology.**—The Glycyrrhiza glabra (Leguminosæ) is a native of Southern Europe; its root contains an amorphous, bitter-sweet glucoside, **Glycyrrhizin**, which is probably in combination with ammonia; it also contains **Asparagin,** sugar, resin, starch, gum, pectin, coloring-matter, etc. Glycyrrhizin, when acted upon by dilute acids, splits up into sugar and a brownish-yellow, bitter substance, **Glycyrrhetin.** The resin is also bitter.

The aromatic glycyrrhizin masks the taste of sulphate of quinine when prescribed with it in about double the quantity, but the after-taste is still bitter. The elixir of aromatic glycyrrhizin is a good vehicle in which to administer sulphate of quinine, but no acid should be added, since the quinine is largely suspended and not dissolved. Liquorice enters into the other adjuvant elixirs for the administration of bad-tasting medicines. A syrup of liquorice may be used as a flavoring agent or as a vehicle.

**Physiological Action.**—Liquorice-root is demulcent and slightly stimulating to the bronchial mucous membranes, and is laxative. It has an agreeable taste, the bitterness being masked by the sweet principle, but leaves an acrid taste in the fauces. The extract covers the taste of other remedies. The root is used as a dusting-powder and coating for pills.

**Therapy.**—The compound infusion of flaxseed (Ph., 1870) is a good demulcent in acute bronchitis and diarrhœa. The extract is useful in relieving dryness of the throat and hoarseness, especially if combined with ammonium chloride. The troches contain gr. $\frac{1}{20}$ of opium, and may be used where an opiate is not objectionable, but are dangerous, since their pleasant taste leads children to take an overdose; one every hour is sufficient for an adult with irritable cough.

The compound mixture is a good expectorant for bronchitis, and is often combined with syrup of senega and ammonium chloride.

In constipation, especially during pregnancy, the compound liquorice-powder is very valuable; given at night on retiring, it causes one or two natural stools in the morning, generally without griping. Where a more decided effect is desired, it may be combined with an equal portion of compound jalap-powder.

## **GOSSYPIUM** (U. S. P.).—**Cotton.**

*Preparations.*

*Gossypii Radicis Cortex* (U. S. P.).—Cotton-Root Bark. *Dose,* ʒ ss–j, in decoction.

*Extractum Gossypii Radicis Fluidum* (U. S. P.).—Fluid Extract of Cotton-Root Bark. *Dose,* f ʒ ss–j.

*Oleum Gossypii Seminis* (U. S. P.).—Cotton-Seed Oil.

*Pyroxylinum* (U. S. P.).—Pyroxylin. Soluble gun-cotton (for making collodion).

*Collodium* (U. S. P.).—Collodion. Pyroxylin dissolved in ether and alcohol.

**Pharmacology and Therapy.**—Cotton is a native of the southern portion of the United States, and is the hairs of the seed of Gossypium herbaceum (Malvaceæ), and of other species of Gossypium, freed from adhering impurities and deprived of fatty matter. It is composed almost entirely of cellulose, and is in a mass of white, interlacing fibres, forming sheets of so-called carded cotton-wool. By a preliminary treatment with alkalies to extract the fatty matters, it becomes absorbent cotton, which is of great value in modern surgical practice, and has succeeded the sponge as a dressing for wounds. Absorbent cotton may be treated with various agents, so as to be of special value (carbolized, borated, salicylated, or treated with mercuric chloride, etc.). These are used to exclude air from wounds, burns, etc., and afford some support, and may also be applied to a blister after puncture. In inflammations, as in acute articular rheumatism, the part may be enveloped in cotton, either dry or moistened with anodynes, with great comfort to the patient. It is also a good material for tampons, or for making an artificial ear-drum after perforation. Cotton is much in use as a padding for splints. Dr. Whitla speaks very favorably of its use in phlegmasia dolens, enveloping the entire limb in a thick layer surrounded by oiled silk and carefully bandaged. Hæmostatic cotton may be make by dipping absorbent cotton in a solution of ferric chloride, and afterward drying and picking it, or dilute Monsel's solution may be used (1 in 24) and the cotton kept immersed in it until used as a tampon, in uterine cancer, etc.

Pyroxylinum, or gun-cotton, is official only as a source of collodion.

The oil of the seeds is bright, pale, odorless, and free from acrid after-taste. It is a good substitute for olive-oil, and is frequently sold for it. It enters into the official liniments of ammonia and of camphor. In pharmacy it answers a similar purpose to olive-oil.

The bark of the root of gossypium contains resin, tannic acid, and a red coloring matter. A solid and a fluid extract can be obtained (both alcoholic), the dose of the former being 1 to 5 grains; of the latter, half a drachm to a drachm. A recent decoction is also used in the South. It has a special action upon the uterus, like ergot, and is employed in the same class of cases—in scanty menstruation, dysmenorrhœa, and during labor. Phillips has found it useful in hæmoptysis, and in the West Indies it is administered in dysentery.

Dr. Poteyenko has extended the use of cotton-root bark to other hæmorrhages. He speaks particularly of a case of persistent epistaxis which had resisted various internal and topical remedies, but which was promptly and permanently checked by the administration of 25 drops of the fluid extract thrice daily for three days. Dr. Garrigues has found this drug of special service in chronic uterine hæmorrhages, even when these depend upon fibroids or carcinoma.

## GRANATUM (U. S. P.)—Pomegranate.

**Dose**, ʒi–ij.

### *Preparations.*

*Decoctum Granati.*—Decoction of Pomegranate (4 to 16). *Dose*, f℥iv–vj.
*Extractum Granati Fluidum.*—Fluid Extract of Pomegranate. *Dose*, fʒi–ij.

**Pharmacology.**—Pomegranate is the bark of the root of Punica granatum (Lythrarieæ), cultivated in subtropical countries. The rind of the fruit and the bark of the stem, though not official, contain similar constituents, and are also useful. The liquid alkaloid, **Pelletiérine** ($\frac{1}{2}$ per cent.), is found in this plant in combination with punico-tannic acid, and to these the peculiar virtues of the bark are due. The tannic acid is largely in excess (20 to 28 per cent.). It has been shown that Pelletiérine is a mixture of four alkaloids, three of which are liquid and one solid. Pelletiérine is a colorless, aromatic, oily fluid, soluble in water, alcohol, ether and chloroform.

According to Professor Flückiger the commercial pelletiérine tannate is a mixture of the tannates of the total alkaloids of pomegranate bark.

**Physiological Action and Therapy.**—Pomegranate has powerful astringent properties, and a decoction flavored with orange or aromatics is useful in sore throat or pharyngitis, and as an astringent injection for gonorrhœa. Coronedi has determined that pelletiérine acts as a muscle poison and probably produces a condition of rigidity. In excessive amount pelletiérine is stated to have an action similar to that of curare, paralyzing motor nerves without influencing muscular contractility or sensation.

The special use of this agent is for the destruction of tapeworms, for which a wineglassful should be taken every hour for three hours, to be followed by a purgative dose of castor-oil. The drug itself, in large doses, acts both as an emetic and purgative. The pelletiérine tannate, 15 grains (1 gramme) at a dose, in capsules, is an effective, but expensive remedy. The decoction is so astringent that it may not be possible for the patient to take it, in which case the same result may be obtained by evaporating it, in a water-bath, to a pilular consistency, and administering the extract thus made in gelatin capsules, preceded and followed by a cathartic. Pomegranate has been used with success in the diarrhœa and dysentery of hot climates. Dujardin-Beaumetz has witnessed good results from the employment of pomegranate in Menière's disease. In paralysis of the third and sixth nerves, M. Galezowski asserts that pelletiérine is of service.

### **GRINDELIA** (U. S. P.).—**Grindelia.**

*Preparations.*

*Extractum Grindeliæ Fluidum* (U. S. P.).—Fluid Extract of Grindelia. *Dose,* ♏x–f℥j.

*Extractum Grindeliæ.*—Extract of Grindelia. *Dose,* gr. i–v.

**Pharmacology.**—The leaves and flowering tops of Grindelia robusta and Grindelia squarrosa, (Compositæ), a perennial California plant, contain a volatile oil, a resin, and, possibly, an alkaloid. The plant possesses a balsamic odor, a warm, aromatic, and bitter taste. The resin is precipitated by water. The active principles are not completely extracted by alcohol, but an aqueous, alkaline solution has been found by Dr. W. P. Gibbons to be the most satisfactory menstruum.

**Physiological Action.**—Grindelia creates a sensation of warmth in the stomach, and, in small quantities, if not too long continued, improves the appetite and digestion. It slows the action of the heart and lungs, and augments the blood-pressure. It possesses antispasmodic and expectorant qualities. Large quantities dilate the pupil, produce a hypnotic effect, and paralyze first the sensory and then the motor nervous system. Death occurs from paralysis of the muscles of respiration. The plant, however, is but feebly poisonous. It exerts some diuretic effect.

**Therapy.**—Grindelia is an efficient local application in dermatitis caused by contact with the rhus toxicodendron, or poison-ivy. Cloths dipped in a mixture of ½ drachm or a drachm of the fluid extract to 4 or 6 ounces of water, and laid upon the affected surface, will, in many instances, afford rapid relief. This mixture as also been advantageously employed upon burns and blisters. A combination with creolin is likewise efficient in these conditions :—

| | | |
|---|---|---|
| ℞ Extract. grindeliæ fl., | | f℥ss. |
| Creolini, | | fʒij. |
| Aquæ, | q. s. ad | f℥v.—M. |

An injection of the above strength is useful in vaginitis, or, applied upon absorbent cotton, in pruritus vaginæ. It may likewise be resorted to in leucorrhœa and endometritis. A weaker solution thrown into the urethra is of service in gonorrhœa and gleet. Diluted with water or glycerin, the fluid extract of grindelia is a beneficial application to chronic or irritable ulcers, and in these cases it is a good practice to conjoin the internal administration of the remedy. One part of fluid extract to four parts of water as a local dressing, together with the internal exhibition of the same preparation, has been found efficient in iritis.

Its fumes may be inhaled for the relief of the paroxysm of asthma, either by smoking in a pipe or saturated in a solution of potassium nitrate, dried and burned upon a plate.

As an internal remedy the chief value of grindelia is in the treatment of asthma. The paroxysm may usually be notably abridged by the administration of 20 or 30 drops of the fluid extract, repeated every twenty or thirty minutes. Two or three such doses will, in many instances, allay the spasm. After the attack has subsided, the medicine should be continued in order to avert recurrence. In the interval grindelia may very profitably be combined with other agents having similar power, as, for example :—

| | | |
|---|---|---|
| ℞ Potassii iodidi, | | ʒvj. |
| Liq. potassii arsenitis, | | fʒiss. |
| Ext. grindeliæ fld., | | f℥ij. |
| Tinct. euphorbiæ pilulif., | | fʒv. |
| Ext. eriodictyi fld., | q. s. ad | f℥iv. |

M. et ft. sol.

Sig.: Teaspoonful three times a day. For asthma and chronic bronchitis.

Another efficient combination in asthma is :—

| | | |
|---|---|---|
| ℞ Extr. grindeliæ fld., | | f℥ij. |
| Potassii iodidi, | | ʒij. |
| Syrup. tolutan., | q. s. ad | f℥iv. |

M. ft. sol.

Sig.: Teaspoonful every three hours.

A formula which has been recommended is :—

| | | |
|---|---|---|
| ℞ Ammonii iodid., | | ʒij. |
| Extr. grindel. fl., | | f℥ss. |
| Extr. glycyrrhiz. fl., | | f℥ss. |
| Tinct. lobeliæ, | | |
| Tinct. belladonn., | āā | fʒij. |
| Syrup. tolutan., | q. s. ad | f℥iv. |

M. ft. sol.

Sig. Teaspoonful three times a day and additionally during a paroxysm.

Grindelia is eliminated in part by the bronchial mucous membrane, which it stimulates. It is an excellent expectorant in chronic bronchitis, and hence when this condition, as is so often the case, complicates emphysema and asthma, grindelia is no less efficacious than in pure nervous asthma. It relieves cough and promotes expectoration in chronic pneumonia. It is sometimes of advantage in ameliorating the cough of phthisis. In shortness of breath due to anæmia, and in some cases of dyspnœa dependent upon valvular disease of the heart, grindelia has proved beneficial. In certain cases of hay fever this remedy has been used successfully. The paroxysms of whooping-cough are diminished in frequency and mitigated in severity by the administration of grindelia. As it escapes from the system principally by the kidneys, it exerts a favorable influence upon pyelitis and chronic cystitis. The dried leaves may be moistened with nitre solution, and, mixed with a little tobacco, rolled into cigarettes for use in asthma.

**Grindelia squarrosa** has some reputation also for the cure of malarial affections.

### GUAIACUM.—Guaiac.

*Preparations.*

*Guaiaci Lignum* (U. S. P.).—Guaiacum Wood. The heart-wood of Guaiacum officinale and of Guaiacum sanctum (Zygophylleæ).

*Guaiaci Resina* (U. S. P.).—Guaiac. The resin of the wood of Guaiacum officinale. *Dose*, gr. v–xv.

*Tinctura Guaiaci* (U. S. P.).—Tincture of Guaiac. *Dose*, ♏x–f℥j.

*Tinctura Guaiaci Ammoniata* (U. S. P.).—Ammoniated Tincture of Guaiac. *Dose*, ♏x–f℥j.

*Pilulæ Antimonii Compositæ* (U. S. P.).—Compound Antimonial Pills. (Contain guaiac, and sulphurated antimony and calomel.)

**Pharmacology.**—The wood of guaiac, or lignum-vitæ, enters into two official preparations of doubtful value, the compound decoction of sarsaparilla and the compound syrup of sarsaparilla, formerly in repute as alteratives, but seldom used at present except as a vehicle for potassium iodide, to cover its unpleasant taste. The resin is the most important constituent of the wood (20 to 25 per cent.), from which it is obtained by heating or by boiling with water. The resin contains **Guaiacetic acid** (10 per cent.), **Guaiaconic acid** (70 per cent.), **Guaiacic acid** (a small quantity), and **Beta-Guaiac resin** (10 per cent.), with some **Guaiac yellow.** The active principles are insoluble in water, but soluble in alcohol and alkaline fluids.

**Physiological Action.**—It is esteemed to be alterative and expectorant, but the taste is so unpleasant as to greatly limit its use in medicine. It is a gastro-intestinal irritant, stimulating the liver, and is stated by some to act also on the excretory organs of the skin; and, when it fails to act upon the skin, is diuretic. Dr. Murrell finds it an efficient laxative.

**Therapy.**—Guaiac was formerly used as an alterative and antisyphilitic, but it is not much valued for this at present,—only as an ingredient in the compound preparations of sarsaparilla, which are used as vehicles for the iodides. In tonsillitis, frequent small doses of the tincture will sometimes cut an attack short.

As a gargle in acute tonsillitis Dr. S. Solis-Cohen makes use of the following preparation:—

| | | |
|---|---|---|
| ℞ Tr. guaiaci ammoniat., | | f℥ss. |
| Tr. cinchon. co., | | fʒij. |
| Mell. despumat., | | f℥vj. |
| Infus. cocæ, | | f℥ij. |
| Sodii salicylat., | | ʒjss |
| Aquæ, | q. s. ad | f℥vj. |

M. ft. sol. Sig.: A tablespoonful to be used in divided portions and, if advisable, a small quantity may be swallowed.

In various neuralgic and rheumatic affections, in rheumatoid arthritis, in amenorrhœa, and in dysmenorrhœa, it is also very useful. In rheumatic sore throat, the ammoniated tincture may be administered internally, and added to hot water makes a good gargle.

The ammoniated tincture has been given for the purpose of relieving chronic hoarseness dependent upon thickening of the vocal cords.

The compound known in Philadelphia as Zollickofer's mixture is often advantageous in chronic rheumatism. Its composition is:—

| | | |
|---|---|---|
| ℞ Pulv. resin. guaiaci, | | |
| Potass. iodid., | āā | gr. x. |
| Tinct. colchici sem., | | fʒss. |
| Aq. cinnamomi, | | f℥ss. |
| Syrupi, | q. s. ad | f℥j. |

M. Sig.: From a dessertspoonful to a tablespoonful three times a day.

Good results are sometimes obtained from guaiac in chronic gout, gouty bronchitis, and lumbago.

Dr. Augustus A. Eshner has found the following formula of service in myalgia:—

| | | |
|---|---|---|
| ℞ Tinct. guaiac. ammoniat., | | |
| Extr. cimicifugæ fl., | | |
| Extr. cocæ fl., | āā | f℥j. |

M. Sig.: Teaspoonful before each meal.

In valvular lesions of the heart dependent upon a rheumatic element Dr. A. E. Tussey has prescribed with advantage:—

| | | |
|---|---|---|
| ℞ Resin. guaiaci,<br>Digitalis pulv. fol.,<br>Quinin. sulph., | āā | gr. xxx. |
| Strychnin. sulph., | | gr. j. |

M. et ft. pil. no. xxx. Sig.: One pill thrice daily.

The ammoniated tincture is regarded as the best preparation; it may be given in milk, in glyceritum vitelli, or in aromatic elixir of liquorice. In chronic constipation Murrell* has obtained very satisfactory results from the administration of the resin in 10- or 20-grain doses, in ½ ounce of thick extract of malt, two or three times daily, according to the case. It occasionally produces a rash. Murrell advises the trial of a triturate with cream of tartar, sugar of milk, or some other inert substance.

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* *Medical Bulletin*, January, 1891, "Guaiacum as a Laxative," by William Murrell, M.D., of London, England.

## GUARANA (U. S. P.).—Guarana.

### *Preparation.*

*Extractum Guaranæ Fluidum* (U. S. P.).—Fluid Extract of Guarana. *Dose,* ♏x–f℥j.

**Pharmacology.**—A dried paste prepared from the crushed or ground seeds of Paullinia sorbilis (Sapindaceæ), a climbing plant of Brazil. It is in round masses or cylindrical sticks, resembling chocolate in color and odor. It contains **Guaranine** (5 per cent.), an alkaloid probably identical with **Caffeine,** besides **tannic acid** (25 per cent.), traces of volatile oil, saponin, etc.

**Physiological Action.**—The physiological effects are the same as those of coffee or chocolate, but it is of very uncertain strength.

**Therapy.**—The principal use of guarana is in nervous headache, $\frac{1}{2}$-drachm doses of the fluid extract being administered every hour during the beginning of the attack. It has also been used in diarrhœa.

In the headache of chlorosis Dr. Alb. Robin, of Paris, often prescribes :—

R Pulv. guaranæ, . . . . . . . . . . gr. iij.
Extr. cannabis Ind., . . . . . . . . . gr. $\frac{1}{6}$.
M. et ft. pil. no. j.
Sig.: One such pill to be taken thrice daily.

Guarana has been advantageously employed as a tonic during convalescence from severe disorders.

## GURJUN.—Gurjun Balsam or Oil, Wood-Oil.

**Dose,** ♏x–f℥ij, in emulsion or capsules, or with extract of malt.

**Pharmacology.**—An oleoresin obtained from the Dipterocarpus turbinatus and other species of Dipterocarpaceæ of East India. The balsam flows from the wounded tree. It contains from 40 to 70 per cent. of volatile **oil,** some **resin,** and **Gurjunic acid.** It resembles copaiba in physical and physiological properties, but is more acceptable to the digestive organs and has less effect upon the kidneys.

**Therapy.**—Gurjun-oil is antiseptic and alterative. It likewise exerts a laxative and diuretic influence. In combination with lime-water (1 to 4) it is a useful application in psoriasis and chronic eczema. It has been employed in leprosy, both internally and locally, with asserted curative effect. The oil has been administered successfully in the treatment of gonorrhœa and gleet, also in chronic bronchitis.

## GUTTA-PERCHA.—Gutta-Percha.

### *Preparation.*

*Liquor Guttæ-Perchæ.*—Solution of Gutta-Percha (gutta-percha 9 per cent., lead carbonate 10, in chloroform). Used externally.

**Pharmacology.**—The concrete exudation of Isonandra gutta (Sapotaceæ), a tree of the East Indies. It is insoluble in water or in alcohol, but soluble in chloroform, oil of turpentine, and carbon disulphide. Softens easily and can be cut with a hot knife.

**Therapy.**—Used externally in sheets for making moulded splints, as, after softening with hot water, it adapts itself to the surface and soon hardens again. It is also used in making mechanical appliances such as pessaries, specula, etc. The solution is used as a protective, like collodion.

A solution of 1 part of gutta-percha in 10 parts of chloroform is known by the name of traumaticin, and in the treatment of certain cutaneous disorders answers a good purpose as a solvent for various medicaments. The solution constitutes a cleanly application and one which is not too easily removed.

### **HÆMATOXYLON** (U. S. P.).—**Hæmatoxylon, Logwood.**

*Preparations.*

*Decoctum Hæmatoxyli.*—Decoction of Hæmatoxylon (℥i–Oj). *Dose*, f℥i–f℥ij.
*Extractum Hæmatoxyli* (U. S. P.).—Extract of Hæmatoxylon. *Dose*, gr. v–x.

**Pharmacology.**—Logwood is the heart-wood of Hæmatoxylon campechianum (Leguminosæ), a large tree of Central America and the West Indies. It occurs as chips or raspings of a reddish-brown color. Tannin is the principal medical constituent. It also contains **Hæmatoxylin** (12 per cent.), a red coloring constituent resembling liquorice in its taste, which is soluble in water and in alcohol.

**Physiological Action.**—Hæmatoxylon is astringent and tonic, and unirritating. It colors the urine and stools red, and has the disadvantage of staining the linen. It does not produce constipation.

**Therapy.**—Formerly used as an astringent for children's diarrhœas, but, as the medicine was occasionally spilt or vomited upon the clothing, it was productive of much dissatisfaction, and was abandoned, especially since the new dietetic and antiseptic method has come into vogue. Nevertheless, it is of decided value in tuberculous diarrhœa, and should not be entirely overlooked. The decoction has been used as an astringent in leucorrhœa and bleeding hæmorrhoids.

### **HAMAMELIS**[*] (U. S. P.).—**Hamamelis, Witch-Hazel.**

*Preparations.*

*Extractum Hamamelidis Fluidum* (U. S. P.).—Fluid Extract of Hamamelis. *Dose*, ♏x–fʒj.
*Aqua Hamamelidis Destillata.*—Distilled Extract of Witch-Hazel. *Dose*, fʒi–ij.

**Pharmacology.**—The leaves of Hamamelis Virginica (Hamamelaceæ) collected in autumn are official, and, although not stipulated by the pharmacopœia, they should be **fresh**, as they owe their efficacy largely to some volatile principle not yet isolated; they also contain tannin and a bitter extractive coloring matter, etc. The old leaves and many preparations are devoid of physiological activity, but a well-made fluid extract, and especially the distilled extract, have been found to have decided therapeutic power. The bark of the younger branches is more astringent than the leaves; it contains about 8 per cent. of tannin, and can be used for the same purposes as the leaves. It is probable that the popular distilled extract is made from the leaves and smaller twigs, freshly gathered and treated with dilute alcohol before distillation. Some of the undoubted good results of this agent as a local application, as a wash, a gargle, etc., may be due to the alcohol present.

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[*] See papers by the author on "Hamamelis Virginica," read before the British Medical Association Section of Therapeutics, at Brighton, August, 1886—*The Medical Register*, June 4, 1887; "Hamamelis in the Treatment of Diseases of the Skin," read before the Section of Dermatology at the Meeting of German Naturalists and Physicians, held in Berlin, September, 1886—*The Medical Bulletin*, December, 1886. See also paper on "Hamamelis and Alcohol," by Dr. E. H. Griffin—*Medical Record*, December, 1890.

**Physiological Action.**—Negative physiological results from an investigation of the root have been reported by Wood and Marshall. Dujardin-Beaumetz, on the other hand, believes that witch-hazel owes its utility to an action on the muscular fibres of the veins. Hector Guy (*Thèse de Paris*, 1884) reports, after experiments with witch-hazel, that it shows no special physiological action on the vascular system, but that headache sometimes follows full doses.

**Therapy.**—For sprains, bruises, and superficial inflammations, the distilled extract is a pleasant and valuable application. It is also useful diluted with 2 to 3 parts of water or alcohol in inflammation of the gums, pharyngitis, nasal catarrh after the removal of nasal polypi, in the form of a spray or wash. Either form may be injected into the bladder, properly diluted, in cases of catarrhal inflammation or hæmorrhage. The topical application of hamamelis is much more decidedly hæmostatic than is explained by our present knowledge of its composition. It is a reliable agent in the treatment of capillary hæmorrhage from wounds, epistaxis, bleeding sockets after the extraction of teeth, and in bleeding piles is one of the most efficient agents at our command. This medicament, says Flagg, is very efficacious, and is particularly valuable from its constant and persistent power of inducing response; in chronic and incurable hæmorrhagic, anæmic, and inflammatory conditions, it has frequently maintained its beneficial effects for many consecutive years. Leg-ulcers, especially those occasioned by varicose veins, are remarkably benefited by the application of a lotion or ointment containing witch-hazel. This drug possesses a marked sedative as well as astringent action upon congested or inflamed tissues. Hamamelis ointment, in the proportion of 15 to 20 grains or more of excipient, often, therefore, proves of avail in burns, erysipelas, eczema, and herpes. Excessive secretion is likewise restrained, and for this reason it is sometimes of service in seborrhœa, acne, and rosacea:—

| | |
|---|---|
| ℞ Ext. hamamelidis fld., . . . . . . . . | fʒ i–iss. |
| Zinci oxidi, . . . . . . . . . . | ʒj. |
| Amyli, . . . . . . . . . . . | gr. xl. |
| Glycerini, . . . . . . . . . . | ♏xxx. |
| Ung. aquæ rosæ, . . . . . . . . . | ℥j. |

M. An ointment for sunburn, eczema, intertrigo, etc.

A lotion made from the fluid extract relieves the pain and stiffness of chronic rheumatism. A diluted fluid extract is an efficient lotion in carbuncle, chancroid, freckless, hyperidrosis, and lupus erythematosus. In burns and frost-bites the following combination is useful:—

| | |
|---|---|
| ℞ Liq. plumbi subacetatis, | |
| Tinct. opii, . . . . . . . . . āā | f℥j. |
| Aq. hamamelidis dest., . . . . . . . . | f℥ij. |
| Aquæ, . . . . . . . . . . . | Oj.—M. |

Fissures of the anus and ulcers of the anus or rectum are improved by the application of a wash or ointment containing witch-hazel.

A 1-per-cent. solution of creosote in decoction of hamamelis with the addition of boric acid has been recommended as an excellent injection in gonorrhœa.

Given by the mouth, hamamelis is scarcely less astringent and sedative than when applied externally. It renders good service in cases of acute or chronic diarrhœa, enteritis, and dysentery. It restrains suppuration in pyelitis and reduces the inflammatory congestion of cystitis. In hæmorrhage from internal organs it is an admirable remedy, and may be given with considerable confidence in bleeding from the stomach, bowels, kidneys, womb, or lungs, and in purpura hæmorrhagica. Hamamelis is useful in chronic bronchitis attended by copious discharge. It may be of service in the night-sweats of phthisis. Its internal, conjoined with its external, use is productive of excellent results in epistaxis and varicose ulcers. Varicose veins, varicocele, and internal hæmorrhoids may, not infrequently, be entirely cured by the persistent administration of hamamelis. It has been found serviceable in phlegmasia dolens and often mitigates the pain of dysmenorrhœa. The combined internal and external use of witch-hazel is useful in gonorrhœa after subsidence of the acute stage, and in leucorrhœa. Witch-hazel, also, has the reputation of preventing abortion.

### HAZELINE.

**Dose,** ♏x–f℥ij.

**Pharmacology and Therapy.**—This is the name of an excellent preparation made by Burroughs, Welcome & Co., of London, from the twigs of witch-hazel. The active principles of the plant are contained in hazeline, which is a useful embrocation in cases of contusion, sprain, and chronic rheumatism. It is applied upon absorbent cotton for the relief of hæmorrhoids and to allay the pain and smarting of burns, eczema, and erysipelas. Diluted with water, it may be beneficially injected into the rectum for internal hæmorrhoids. As a gargle or inhalation, it is useful in coryza, ozæna, and pharyngitis. A hazeline-cream is also prepared by the same firm, and is composed of hazeline, lanolin, and cold-cream. The combination makes an elegant soothing emollient and mild astringent ointment. It possesses decided penetrating power when used upon the integument, and is a very excellent antiseptic fatty substance. Hazeline-cream has a most agreeable action upon the skin, especially when rough or irritable, rendering the surface soft, smooth, and elastic. As a toilet-cream it is of service, especially in chapping or in irritation from the atmosphere. It is of benefit, also, in the treatment of alopecia or loss of hair, the hair often resuming its natural gloss and polish under its use, and the irritation of the sebaceous glands being overcome. This cream has been found of service in acne rosacea, subacute cases of eczema, erythema, abrasions, and excoriations upon different parts of the body. Internally, hazeline, in drachm doses, is beneficial in varicose veins, internal hæmorrhoids, epistaxis, hæmoptysis, metrorrhagia, hæmorrhage from the bowels and kidneys.

## HEDEOMA (U. S. P.).—Hedeoma, Pennyroyal.

*Preparations.*

*Oleum Hedeomæ* (U. S. P.).—Oil of Hedeoma. *Dose*, ♏ii–x.
*Spiritus Hedeomæ.*—Spirit of Hedeoma (10 per cent. of oil). External use.

**Pharmacology.**—The leaves and tops of Hedeoma pulegioides (Labiatæ) contain an aromatic, volatile oil, which is official, and is its only important constituent. It is stimulant, carminative, and emmenagogue.

**Physiological Action and Therapy.**—Pennyroyal-tea, or a recent infusion of the leaves and tops, is used in flatulent colic and recent suppression of the menses. The oil may be similarly employed, but is very seldom used internally except as a constituent of emmenagogue pills. Dr. Wingate has reported the case of a woman who took a teaspoonful of the oil of pennyroyal with half a teaspoonful of the fluid extract of ergot. In an hour she was unconscious, with small pulse, cold extremities, and slightly-dilated pupils. Several convulsions occurred, and opisthotonos was well marked. Morphine and atropine hypodermically with heat externally proved restorative. Hedeoma is carminative and can be used for flatulence.

The fresh herb is said to be obnoxious to mosquitoes, and may be hung about the sleeping room, or the hands and face bathed with a recent infusion or a solution of the oil in alcohol (1 to 10), in order to keep off these midnight marauders. The spirit may be used with an atomizer or as an embrocation for the same purpose.

## HELIANTHEMUM.—Helianthemum, Frostwort.

**Pharmacology and Therapy.**—The whole herb of the Helianthemum Canadense (Cistaceæ) is a domestic remedy as an alterative and astringent. It contains tannin and some bitter substance. A recent decoction may be used, but a fluid extract made with diluted alcohol (dose, fʒi–ij, several times a day) is a better preparation for diarrhoea and dysentery. It is also esteemed useful as a tonic in scrofula and syphilis.

## HELIANTHUS ANNUUS.—Sun-flower.

**Pharmacology and Therapy.**—Helianthus annuus (Compositæ), a well-known plant, a native of Peru but cultivated in many parts of America and Europe and in China. It is valued chiefly on account of the fixed oil obtained from its seed. The oil possesses nutritive properties and is an excellent illuminating material. Other constituents of the plant are helianthitannic acid, inulin, levulin, a dextrorotatory sugar, and a peculiar oleoresin. In different parts of the world the sun-flower is popularly esteemed as a remedy in malaria. M. Moncorvo, of Rio de Janeiro, has reported to the Therapeutical Society of Paris his clinical experiments with sun-flower in 100 cases of malaria occurring among children. He found that the plant exerted a decided influence. In sixty-one patients, from 1 month to 12 years of age, the action of the medicine could be watched for a sufficiently long time, and all the patients recovered as rapidly as if they had taken quinine. M. Moncorvo used the tincture and an alcoholic extract and seems to prefer the former preparation. The drug was nearly always well tolerated in the dose of 30 drops to 2½ fluidrachms of the tincture, administered in a potion every two hours and taken in four or five doses. The alcoholic extract was given in the dose of 15 to 90 grains.

### HELLEBORUS.—Hellebore.

**Dose**, gr. iv–xv.

**Pharmacology.**—The black hellebore, Helleborus niger (Ranunculaceæ), an ancient remedy, is a native of Central and Southern Europe, and is cultivated in England and the United States for its showy flowers. The rhizome with rootlets is the part used. The most important constituents are two glucosides,—**Helleborin** and **Helleborein,**—both crystalline, which are cardiac and nervous poisons. There is no tannin.

**Physiological Action.**—The taste is bitter and acrid; the freshly bruised drug, but not the dried preparation, has a somewhat rancid odor. The dust is irritating and causes violent sneezing. Internally the effects are emetic, drastic, cathartic and emmenagogue. In its action upon the heart it resembles digitalis. Venturini and Gasparini have ascertained that solutions of helleborein, dropped into the conjunctival sac of rabbits and dogs, produce, within fifteen minutes, such complete anæsthesia that the cornea can be penetrated without causing pain. At the same time, the sensibility of other parts of the eye and its appendages are left intact. The anæsthesia is of longer duration than that due to cocaine. No alteration of the pupil or the intra-ocular pressure is produced.

**Therapy.**—Rarely used at present, except as an ingredient in some proprietary emmenagogue pills. (For American hellebore, see Veratrum Viride.)

Helleborein, which is soluble in water, has been experimentally employed in doses from $\frac{1}{10}$–$\frac{1}{4}$ grain as a substitute for digitalis.

### HELONIAS.—Helonias, False Unicorn.

**Dose**, gr. xv.

**Pharmacology and Therapy.**—The Chamælirium luteum (Gray) or Helonias dioica (Pursh), belonging to the natural order, Melanthaceæ, is a native of North America, east of the Mississippi. The root is the portion used, and, from its resemblance to a horn, is called unicorn-root. It contains a bitter principle, **Chamælirin.** A fluid extract is made with the aid of alcohol, of which the dose is ♏xx–xxx. It is reported to be tonic and anthelmintic.

### HEMIDESMUS.—Hemidesmus, Indian Sarsaparilla.

**Pharmacology and Therapy.**—The Hemidesmus Indicus (Asclepiadaceæ), as is indicated by its name, is a native of India. The root is used in the same way as sarsaparilla. It contains **Coumarin** and a little tannin. It is said to be diaphoretic, alterative, diuretic and tonic. The fluid extract may be given in doses of f℥ss–j.

### HEPATICA.—Hepatica, Liverwort.

**Dose,** fʒss–iss, in fluid extract.

**Pharmacology and Therapy.**—The Hepatica triloba (Ranunculaceæ) is a native of North America. Its leaves contain mucilage and tannin; a recent infusion of them, taken hot, is useful in the early stage of bronchitis. The fluid extract may be employed as a demulcent astringent in diarrhœa.

### HEUCHERA.—Heuchera, Alum-Root.

**Dose,** gr. xxx–ʒij.

**Pharmacology and Therapy.**—The Heuchera Americana belongs to the Saxifragaceæ, and is a native of the United States. The root contains considerable tannin (18 to 20 per cent.), and an infusion or fluid extract is useful as a mouth-wash, gargle, etc., or may be given for diarrhœa.

### HOANG-NAN.[*]

*Preparations.*

*Extractum Hoang-Nan Fluidum.*—Fluid Extract of Hoang-Nan. *Dose,* ♏v–xxx.

*Tinctura Hoang-Nan.*—Tincture of Hoang-Nan. *Dose,* ♏xx–xl.

**Pharmacology.**—Strychnos, gaultheriana, hoang-nan, tropical bindweed, natural order Loganiaceæ, is an exogenous plant, native to the mountainous districts of Laos, Anam, Tonquin, and Cambodia. Its bark, which is the portion used, contains the alkaloids, strychnine and brucine, the latter in larger proportion.

**Physiological Action.**—In small doses hoang-nan quickens and invigorates the heart, accelerates and deepens the respiration, and stimulates secretion. In moderately large doses it produces clonic, succeeded by tonic convulsions. In excessive doses it causes a rapid and considerable decline of arterial pressure, powerful tetanic spasms, and death from respiratory failure. Medicinal doses improve the appetite and digestion, augment intestinal secretion and peristalsis, and exert a stimulant or alterative influence upon the cutaneous glandular systems, both perspiratory and sebaceous, but more particularly the latter.

**Therapy.**—Hoang-nan is an excellent general tonic. It may be appropriately used in the treatment of chronic alcoholism. In small doses it allays nausea, relieves the tremor and prostration which follow a debauch, and sustains the heart upon the withdrawal of alcoholic drink. In anæmia, given in conjunction with iron, hoang-nan is very useful. In amenorrhœa also it is frequently of service. By improving the innervation of the muscular coat of the bronchioles it tends to diminish the frequency and severity of attacks of spasmodic asthma. This remedy is worthy of trial in tobacco amaurosis. It is of value in dyspepsia, and may be used in small doses in the vomiting of pregnancy. In convalescence from typhoid fever it is a good tonic, and is useful in neuralgia, and post-paralytic tremor. It may be serviceably given in Bell's palsy, rheumatic, diphtheritic, or lead paralysis, and for reflex paraplegia. It is a useful drug in neurasthenia. In its home it is of great repute in the treatment of leprosy, hydrophobia, snake-bite, and fevers. The claim for any decided virtue in these affections cannot, however, be maintained.

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[*] "Notes on Hoang-Nan," by the author, *Therapeutic Gazette*, November 15, 1889; "Notes on Hoang-Nan in Diseases of the Skin," *The Journal of the American Medical Association*, October 26, 1889.

Hoang-nan is of marked efficacy in a number of skin diseases. The writer has witnessed marked improvement follow its use in seborrhœa. It has also proved valuable in alopecia. In hyperidrosis and anidrosis this agent possesses an excellent corrective influence upon the disordered secretion, and in bromidrosis it will efficiently assist the action of the local measures employed. In acne and sycosis it has manifested an excellent remedial quality. In eczema pustulosum, hoang-nan will often be found very beneficial. In purpura it has sometimes been successful. Diseases attended by nervo-muscular debility and defective glandular action, such as lichen planus, lichen scrofulosus, herpes zoster, pemphigus, and ecthyma, are benefited by the administration of hoang-nan. In chronic ulcers, scrofula, and the eczema of scrofulous children, this remedy is of service. In scrofuloderma it is especially valuable. In late syphilis, or in syphilis as it occurs in broken-down individuals, hoang-nan is a valuable tonic agent. Hoang-nan may be combined as follows:—

℞ Ext. hoang-nan fld., . . . . . . . . . . f ʒ iss.
Acid. hydrochlorici dil., . . . . . . . . f ʒ iiss.
Tinct. gentianæ co., . . . . . . . q. s. ad f ℥ ij.

M. Sig.: Teaspoonful in water three times a day. For dyspepsia, neurasthenia, etc.

℞ Tr. hoang-nan., . . . . . . . . . . f ʒ iss.
Syr. aurant., . . . . . . . . . . f ℥ j.
Aq. menth. pip., . . . . . . . . q. s. ad f ℥ ij.

M. Sig.: Teaspoonful three times a day. Useful in acne, seborrhœa, eczema genitalium, etc.

## HOMATROPINÆ HYDROBROMAS.—Homatropine Hydrobromate.

**Dose,** gr. $\frac{1}{120}$–$\frac{1}{20}$.

**Pharmacology and Therapy.**—Homatropine is a derivative of atropine, obtained by the decomposition of tropine amygdalate by hydrochloric acid. It is a reliable mydriatic for examination and determination of refraction in ophthalmological practice, having the advantage over other mydriatics in being prompt in its action, but more transitory in its effects, which pass away in from thirty-six to forty-eight hours, while those of hyoscyamine last eight or nine days and those of atropine continue for ten or twelve days. The ordinary solution for paralyzing the accommodation is of the strength of 4 grains to the ounce of distilled water, a few drops of which are instilled into the eye every five or ten minutes until the full effect is obtained. Some hyperæmia of the conjunctiva generally follows its use, but not true inflammation, unless under very exceptional circumstances.

It is less irritant than atropine and much less apt to occasion systemic intoxication. The only evidence of constitutional action usually observed is a moderate retardation of the pulse.

Dr. Pooley has recorded the case of a girl, 7 years of age, in whom intellectual, sensorial and motor disturbances followed the installation of a 2-per-cent. solution of homatropine every fifteen minutes for an hour. Several days elapsed before the patient recovered her usual health.

In the treatment of choroiditis, and other disorders for which a mydriatic is used, atropine is more suitable because its action is more prolonged, and it causes less hyperæmia.

In making homatropine solutions the distilled water should be boiled just before using, and small quantities only made at a time, as distilled water, unless recently boiled, usually contains bacteria and other germs derived from the air, which might induce irritation.

Homatropine hydrochlorate and salicylate are salts which have a similar action to the hydrobromate, the dose of each being from $\frac{1}{120}$ to $\frac{1}{20}$ grain. Besides the mydriatic properties already referred to, these salts have likewise been used in checking night-sweats, especially of phthisis.

### **HUMULUS** (U. S. P.).—**Hops.**

#### *Preparations.*

*Tinctura Humuli* (U. S. P.).—Tincture of Hops (20 per cent.). *Dose*, fʒi–iv.

*Lupulinum* (U. S. P.).—Lupulin. (The glandular powder separated from the strobiles.) *Dose*, gr. v-xx.

*Extractum Lupulini Fluidum* (U. S. P.)—Fluid Extract of Lupulin. *Dose*, ♏v–xv.

*Oleoresina Lupulini* (U. S. P.).—Oleoresin of Lupulin. *Dose*, gr. ii–v.

*Infusum Humuli.*—Infusion of Hops, Hop-tea (ʒiv to Oj). *Dose*, f℥ii–v.

*Extractum Humuli.*—Extract of Hops (inspissated fluid extract). *Dose*, gr. v.

**Pharmacology.**—Hops are the strobiles (or fruit-cones) of Humulus lupulus (Urticaceæ). The glandular powder adhering to the axis and bracts, lupulinum, is the most important part. The constituents are a liquid alkaloid, **Lupuline**, and a bitter principle, **Lupulinic acid**; besides nearly 1 per cent. of volatile oil, 9 to 18 per cent. resin, and 3 to 4 per cent. tannin, etc. Hops likewise contain a fermentable sugar, diastase and a small quantity of asparagine. The fluid extract of lupulin is made with alcohol; the oleoresin is extracted with ether; both are eligible preparations.

**Physiological Action.**—The preparations of hops are stomachic, tonic, hypnotic, slightly diaphoretic, and anaphrodisiac. Although usually devoid of any local irritant effect, Dr. John W. Eckfeldt has met with several cases of severe and prolonged dermatitis caused by the vapor produced in making a hop poultice. He ascribes the effects to the volatilization of the oil of hops with its subsequent condensation upon the skin.*

**Therapy.**—Malt liquors, containing hops, are largely used as aids to the appetite and digestion; unfortunately, many of them contain a very small proportion of hops, the deficiency being made up with aloes or other bitter substances, with cocculus Indicus, grains of paradise, glycerin, soap, salicylic acid, etc., which detract from their value both from a medicinal and a commercial standpoint. A well-made beer of good quality, however, is a useful preparation of hops, and has considerable medicinal value as a tonic during convalescence, or in feeble digestion, or as a stimulant to the appetite and nutrition. The sedative effect of the hops is assisted by the alcohol and carbonic acid, making beer useful in gastric catarrh with gastralgia and as a hypnotic in neurasthenia with insomnia. In this condition a hop-pillow is appropriately used. Though not of much efficacy in itself, yet it assists in producing a narcotic effect. Beer may be given when all other forms of nourishment are refused, as in diphtheria; and eggs, or beef-powder (Mosquera beef-meal) may be added to it to increase its value. The tincture of hops, or the fluid extract of lupulin, are also alcoholic, but in them the proportion of alcohol is so considerable as to make it the chief constituent. Malt liquors increase the flow of milk during lactation.

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* "On the Poisonous Action of Hops." By John W. Eckfeldt, M.D., *Medical Bulletin*, January, 1892.

The sedative effects of hops are obtained from a hop-poultice in local painful affections, or the hops may be placed in flannel and moistened with hot whisky and applied to painful areas, as in toothache or earache, where the warmth and steam are very soothing.

The inhalations of the vapor of hops are often attended with good results, especially in diseases of the throat and chest. Lefferts used with benefit this combination:—

℞ Sodii carbonatis exsiccati, . . . . . . . . gr. xx.
  Aquæ ferv. (140°), . . . . . . . . Oj.
Solve et adde
  Extracti humuli, . . . . . . . . . ʒj.
M. The vapor to be inhaled.

In delirium tremens hop-tea, with a quantity of cayenne-pepper, quiets drink-craving and settles the stomach. In hysteria and nervousness preparations of hops are useful. Hops, especially when employed in the form of the infusion or tincture, are often most efficacious for the hypnotic action in insomnia and restlessness. The following are useful:—

℞ Tinct. humuli, . . . . . . . . . . f℥iij.
  Tinct. capsici, . . . . . . . . . . f℥ij.
  Glycerini, . . . . . . . . . . . f℥ij.
M. Sig.: A tablespoonful every hour or two. For nervousness.

℞ Tinct. humuli,
  Tinct. ammon. valerianatis,
  Spiritus ætheris nitrosi, . . . . . . . āā f℥ij.
M. Sig.: Two teaspoonfuls in water every hour or two. Use in insomnia, hysteria, and nervousness.

In irritation of the genito-urinary passages full doses of the oleoresin of lupulin afford much relief, and it has also been used as an anaphrodisiac in priapism, chordee, spermatorrhœa, and similar affections. A very suitable prescription in genito-urinary irritation, of service in the diseases just referred to, is:—

℞ Lupulini,
  Camphoræ monobromatæ, . . . . . . . āā ʒj.
  Ol. theobromatis, . . . . . . . . . . q. s.
M. et ft. suppositoriæ no. xij.
Sig.: Insert one up the bowel every three or four hours.

## HYDRANGEA.—Hydrangea.

### *Preparation.*

*Extractum Hydrangeæ Fluidum.*—Fluid Extract of Hydrangea. *Dose*, ♏xxx–fʒj.

**Pharmacology and Therapy.**—The root of Hydrangea arborescens (Saxifragaceæ) has long been used by the aborigines, in the South, in the form of a decoction, in the treatment of calculous affections. A fluid extract, made with diluted alcohol, is a convenient form in which to administer the remedy. It is of especial utility in gravel and renal colic.

### HYDRARGYRUM (U. S. P.).—Mercury, Quicksilver.

*Preparations and Salts.*

*Hydrargyrum cum Cretâ* (U. S. P.).—Mercury with Chalk, Gray Powder (mercury 38, clarified honey 10, prepared chalk 57 parts). *Dose*, gr. ss–x.

*Massa Hydrargyri* (U. S. P.).—Mass of Mercury, Blue Mass, Blue Pill (mercury, 33 per cent., with althea, liquorice, glycerin, and honey of rose; a 3-grain blue pill contains 1 grain of mercury). *Dose*, gr. ss–xij.

*Unguentum Hydrargyri* (U. S. P.).—Mercurial or Blue Ointment (mercury, 50 per cent., triturated with lard, suet and oleate of mercury).

*Emplastrum Hydrargyri* (U. S. P.).—Mercurial Plaster (mercury, 30 parts; oleate of mercury, 1.2, lead plaster, q. s. to make 100 parts).

*Emplastrum Ammoniaci cum Hydrargyro* (U. S. P.).—Ammoniac Plaster with Mercury (contains mercury 18, and ammoniac 72 parts).

*Hydrargyri Oxidum Rubrum* (U. S. P.).—Red Mercuric Oxide. *Dose*, gr. $\frac{1}{50}$–$\frac{1}{10}$.

*Unguentum Hydrargyri Oxidi Rubri* (U. S. P.).—Ointment of Red Mercuric Oxide (10 per cent.).

*Hydrargyri Oxidum Flavum* (U. S. P.).—Yellow Mercuric Oxide. For external use.

*Unguentum Hydrargyri Oxidi Flavi* (U. S. P.).—Ointment of Yellow Mercuric Oxide (10 per cent.).

*Oleatum Hydrargyri* (U. S. P.).—Oleate of Mercury (yellow oxide, 20 per cent.; oleic acid, 80).

*Hydrargyri Chloridum Mite* (U. S. P.).—Mild Mercurous Chloride, Calomel, Mild Chloride of Mercury. *Dose*, gr. $\frac{1}{20}$-x.

*Hydrargyri Chloridum Corrosivum* (U. S. P.)—Corrosive Mercuric Chloride, Corrosive Chloride of Mercury, Corrosive Sublimate. *Dose*, gr. $\frac{1}{30}$–$\frac{1}{10}$.

*Hydrargyrum Ammoniatum* (U. S. P.).—Ammoniated Mercury, White Precipitate. For external use.

*Unguentum Hydrargyri Ammoniati* (U. S. P.).—Ointment of Ammoniated Mercury (ammoniated mercury 10, benzoinated lard 90 parts).

*Hydrargyri Iodidum Flavum* (U. S. P.).—Yellow Mercurous Iodide, Protiodide, Yellow (or green) Iodide of Mercury. *Dose*, gr. $\frac{1}{3}$.

*Hydrargyri Iodidum Rubrum* (U. S. P.).—Red Mercuric Iodide, Biniodide. *Dose*, gr. $\frac{1}{50}$–$\frac{1}{10}$.

*Liquor Arseni et Hydrargyri Iodidi* (U. S. P.).—Donovan's Solution (1 per cent each arsenic iodide and red mercuric iodide). *Dose*, ♏i–x.

*Liquor Hydrargyri Nitratis* (U. S. P.).—Solution of Mercuric Nitrate. A powerful caustic.

*Unguentum Hydrargyri Nitratis* (U. S. P.).—Ointment of Mercuric Nitrate, Citrine Ointment (mercury 7, nitric acid 17, lard 76 parts).

*Hydrargyri Subsulphas Flavus* (U. S. P.).—Yellow Mercuric Subsulphate. *Dose*, gr. ii–v, as an emetic for children.

*Hydrargyri Sulphidum Rubrum.*—Red Mercuric Sulphide, Cinnabar. Used only in pharmacy and for fumigation.

*Hydrargyri Salicylas.*—(Mercurous salicylate, dose, gr. $\frac{1}{8}$–$\frac{1}{4}$; mercuric salicylate, dose, $\frac{1}{12}$–$\frac{1}{8}$).

*Hydrargyri Cyanidum* (U. S. P.).—Mercuric Cyanide. *Dose*, gr. $\frac{1}{100}$–$\frac{1}{32}$.

*Hydrargyri Formamidatum.*—Formamidate of Mercury. For hypodermic use. *Dose*, gr. $\frac{1}{6}$.

*Hydrargyri Tannas.*—Mercurous Tannate. *Dose*, gr. ss–j.

*Lotio Flava.*—Yellow Wash (corrosive sublimate, gr. xxiv, in lime-water, f℥xvj). For external use.

*Lotio Nigra.*—Black Wash (calomel, gr. lxiv, in lime-water, f℥xvi).

Triturations can be made with any mercurial and sugar of milk, usually in decimal proportions.

**Pharmacology.**—Commercial mercury is always impure, being combined with tin, antimony, zinc, and other metals. It can be purified by treating it with dilute nitric acid, and afterward washing it free from the acid with water. In the pure state, it is a shining, silver-white metal, liquid at common temperatures, and having the specific gravity of 13.5. The chlorides are the salts of the greatest medical importance. They are made by double decomposition; thus, mercuric sulphate and sodium chloride are triturated together and heat applied, when the mercuric (or corrosive) chloride sublimes in the form of white crystalline masses or powder; in order to form the mercurous chloride (calomel), an additional proportion of mercuric sulphate is added before subliming. Owing to the tendency to combine with other metals, the presence of mercury may be ascertained by half immersing a gold piece in a suspected solution, when the mercury will be deposited as a gray or silver coating, if present. Reinsch's test and the reduction test may be employed as in testing for arsenic, when the small globules of mercury may be detected upon the glass, which are as easily recognized with the microscope as the crystals of arsenic.

In accordance with the chemical theory of Mialhe, it is usually taught that calomel is converted within the body into corrosive sublimate by the agency of sodium chloride. As a result of careful experiments, Dr. Paul Adams finds, that although this change may take place in the air, the access of air is practically excluded from the alimentary tract and that but a trace of calomel passes into solution. This is the case even in the presence of organic matter, and he arrives at the conclusion that sodium chloride is not incompatible with calomel. For the same reason it had generally been held that muriatic or nitro-muriatic acid should not be given in conjunction with the mild chloride.

**Physiological Action and Antidotes.**—The salts of mercury are very poisonous to all lower forms of life, and mercurial solutions form our most convenient and useful antiseptics. Applied to the skin, in concentrated form, most of them are irritating, and some are destructive, to the tissues. They easily diffuse through the integument, and may in this way cause systemic effects, even from the solutions employed for antiseptic purposes, but especially from inunctions with mercurial ointment or fumigations. When taken into the blood, mercury, in very minute doses, increases the number of red blood-corpuscles, especially in conditions of cachexia or anæmia. This has been called the tonic action, and is obtained from doses of a hundredth of a grain or less of the corrosive chloride three times a day. In larger doses the salt is a cardiac poison, lowering its action and destroying the red blood-corpuscles and reducing the fibrin. At the same time mercury has marked influence upon the nervous system, causing debility with tremors. Various forms of paralysis are produced by the influence of this metal, especially among workmen who are habitually exposed to its vapors. The nervous disorder is often accompanied by a brownish discoloration and a dryness of the skin. Symptoms simulating those of chronic lead poisoning, including wrist-drop, have been known to result from mercurial inunction often repeated. Nerves of special sensation may be affected. Neuralgia, epilepsy and insanity may also occur in consequence of the absorption of mercury. It also affects the digestive organs, causing diarrhœa, more or less salivation, and a fetid breath; if continued a sufficient length of time emaciation also occurs. These symptoms, taken collectively, constitute **Hydrargism,** or **Mercurial Cachexia,** or **Crethism,** which might be mistaken for malignant disease, especially if accompanied by some enlargement of the liver. Pure metallic mercury is not poisonous, and passes through the alimentary tract unchanged, acting as a mechanical laxative. Acute poisoning by corrosive sublimate occurs when a toxic dose has been swallowed. The symptoms are immediate and violent: these are vomiting; purging, at first serous, afterward bloody; burning pain in the stomach and œsophagus, suppression of urine, face swollen and bloated, with much prostration of the bodily powers, etc. Severe and even fatal intoxication may take place from absorption through an abraded surface. Dr. Sackur has recently published the history of a case in which death occurred in consequence of absorption of mercurial ointment through some trivial fissures of the skin.

Albumin is the antidote to corrosive sublimate; eggs and milk should be freely swallowed, the stomach washed out with a stomach-pump, arterial stimulants administered, hypodermic injections of morphine and whisky given, and external heat applied. After the first symptoms are over, the patient is liable to perish from ulceration or stricture of the œsophagus, destruction of the peptic glands in the stomach, salivation, and exhaustion.

The action of mercury upon the liver has occasioned much controversy, and is not yet satisfactorily settled. It is believed that the corrosive chloride in small doses is a hepatic stimulant and cholagogue; but this action is denied to calomel, which directs its action principally to the excretory glands in the lower part of the small intestine and colon. It is not yet known, however, in what form calomel enters the blood, but it is possible that a soluble combination is formed with albumin and hydrochloric acid; it is even possible that part of it may be changed into corrosive chloride, in which case some action upon the liver would naturally follow. Whatever ingenious explanation the laboratory may have to offer with regard to the cholagogue action of the mercurials, and calomel especially, clinical medicine has already settled the fact that where the tongue is heavily coated and the conjunctivæ slightly jaundiced, the skin sallow, and the liver inactive, with clay-colored stools, it can all be set right with a few small doses of calomel, and bilious stools be produced.

The diuretic action of mercury has of late years attracted considerable attention. It has been found that mercury, and more especially calomel and blue-pill, have the power of decidedly promoting the action of diuretics. Boem (*British Medical Journal*) claims that the absorption of mercury salicylate, which is incomplete, is, however, greater than that of calomel. It is stated, as the result of some recent investigations by F. Klemperer,* that, in rabbits, corrosive sublimate injected into the blood was eliminated by the intestinal glands and kidneys. In acute cases there was congestion of the kidneys, with extravasations, and, if prolonged, the parenchyma showed signs of inflammation, with a deposit of chalk in the straight tubules; while, in the dog, there occurred fatty degeneration instead of chalky deposit. According to the studies of Calantoni, if death is not caused within ten hours necrosis of the renal epithelium occurs. Intestinal lesions are chiefly present in the colon and consist of hyperæmia, hæmorrhage and necrosis. No apparent relation exists between the severity of the renal and intestinal lesions.

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* *Therapeutic Gazette*, October 15, 1890, p. 693.

It is evident that mercury in small doses is capable of acting as a stimulant to the kidneys, and this agrees with the observations of Jendrassik upon the use of calomel as a diuretic. Mercurials, therefore, are useful additions to squill, digitalis, and other diuretic remedies.

Upon the salivary glands, mercurials have very stimulating effects. The salivary secretions may be increased to several pints daily, the fluid at first being albuminous and thick, but subsequently becoming thin and watery. The irritation may cause inflammation, and ulceration or sloughing of the mouth or cheek may result, especially where the patient is in poor physical condition or suffers with some cachexia, or is exceptionally susceptible to the action of mercury. The condition of the general system accompanying the action of the mercurial upon the salivary glands and mouth is known as "ptyalism," or salivation. A febrile movement of low type usually accompanies these manifestations. It has been found by Dr. Petersen that disease of the kidney establishes a predisposition to the occurrence of ptyalism. For this reason, when the gums of a syphilitic patient become affected the urine should at once be examined.

Ptyalism is best treated by mouth-washes containing potassium chlorate and tincture of myrrh, and by tonics and small doses of belladonna, or atropine with morphine. The gums may become inflamed, soft, and bleeding, and the teeth loose, but under this treatment the inflammation subsides and the teeth again become firm. Salivation was of such common occurrence when mercury was given freely that it was looked upon as salutary, and it was thought necessary to "touch the gum" in order to obtain therapeutic results from the remedy; but this idea no longer prevails, and patients are no longer salivated intentionally, and this part of the so-called antiphlogistic treatment has fallen into disuse.

Salivation is a reflex phenomenon and depends upon a primary mercurial stomatitis. Both these effects are much more decided when the drug is administered by inunction. Ricord found perfectly healthy salivary glands in a ptyalized patient who died of an intercurrent disease. In administering mercury it is important that the mouth be kept in good condition. The presence of carious teeth, for instance, is often the starting point of a stomatitis. P. Diday has reported a case in which this accident was transferred by kissing from man to wife, and believes that we may admit that certain of the numerous microbes which inhabit the mouth become virulent under the influence of the mercurial impregnation.

A bright or dark red rash sometimes occurs upon the skin while mercury is being taken. The discoloration may be attended by itching and may be followed by desquamation. An eruption resembling that of smallpox has been observed as a consequence of the use of a $\frac{1}{2}$-per-cent. sublimate solution as a vaginal wash conjoined with the application of a mercurial ointment to the abdomen. Cases have been observed in which mercury caused generalized dermatitis with swelling, desquamation, subcutaneous infiltration, fever, and prostration. This form of intoxication may even have a fatal termination.

The external as well as internal use of mercury may occasion local paralysis, as in a case narrated by Dr. A. W. Foot in which there was loss of power in the muscles of the hand and forearm after rubbing cattle with an ointment containing the red iodide.

The metal is eliminated in the urine. It has been detected in most of the tissues and secretions of the body.

After death from mercury the chalky deposits in the kidneys and diphtheroidal hæmorrhagic inflammation of the large intestine are evidences of the nature of the poison.

**Therapy.**—The most common local application of mercurials at present is in antiseptic surgery. The solutions have the advantage of convenience, being easily made and cheap, odorless and permanent. The field of operation, having been well soaped and shaved and washed with ether, is usually irrigated with a solution of corrosive sublimate (1 to 2000, or stronger if the skin is unbroken). For washing out wound-cavities, or the peritoneum, much weaker solutions should be made use of (1 to 6000 or 10,000), or simply freshly-boiled warm water employed for a douche. In lying-in hospitals, or where the surroundings are decidedly unhygienic, and also where symptoms of septic infection are manifested after delivery, the danger may be averted by the free use of antiseptic vaginal douches several times a day.

The use of corrosive sublimate injections during and after parturition has caused a remarkable reduction of the death-rate in lying-in hospitals.

A mercurial solution has also been used to irrigate the uterus in puerperal septicæmia, but the practice is not without danger of giving rise to poisoning by absorption.

An extract* will show the value of corrosive sublimate in combination with an acid as an antiseptic as follows:—

"In 1880, Koch demonstrated that bichloride of mercury (sublimate) was the most powerful of antiseptics. It was found that in a solution of 1 to 1000 it would soon destroy the spores of anthrax, the most virulent of all germs. This was true with regard to non-albuminous media, but when the medium to be disinfected contained albumin the mercury coagulated the albumin, formed an albuminate of mercury, which deposited, leaving the supernatant liquid practically free from mercury, and, hence, without antiseptic power. Dr. Ernest Laplace, in Koch's laboratory, seeking a method to prevent this coagulation, and, therefore, to retain for the mercury its same disinfecting power in albuminous as in non-albuminous fluids, found that an addition of a small quantity of any acid to the ordinary solution would fulfill this purpose. Accordingly, the acid sublimate solution consists of—

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* Laplace, *Deutsche Med. Woch.*, No. 40, 1887.

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|---|---|
| Sublimate, | 1 part. |
| Hydrochloric acid (pure), | 5 parts. |
| Water, | q. s. ad 1000 " |

"Hydrochloric acid is used preferably to all others. When, however, the acid sublimate must be carried in a solid form, tartaric acid is substituted for the hydrochloric acid.

| | |
|---|---|
| Sublimate, | 1 part. |
| Tartaric acid, | 5 parts. |

To be made into a tablet, which must be dissolved in 1000 parts of water.

"This form was adopted by the Academy of Medicine of Paris, to be used by midwives throughout France. The acid sublimate is the only disinfectant used in Koch's laboratory. It is also used in the Pasteur Institute of Paris. Besides being the surest and most powerful antiseptic, it is the only solution of mercury that will always retain its integrity, and never form a deposit of earthy salts.

"It is used for all manner of disinfection, except that of instruments. In a solution as weak as 1 to 50,000 it retains sufficient power to destroy the germs of suppuration."

Dr. A. C. Abbott enjoins caution in the use of corrosive sublimate upon open wounds for the reason that the albumin of the parts tends to counteract its influence and that it materially injures the integrity of the tissues, impairing the normal resistance of the solids and fluids of the body to the attacks of micro-organisms. As a result of many experiments he finds that, under favorable conditions, only a certain number of the pathogenetic microbes are destroyed by the mercurial and that, though the remainder may be temporarily attenuated, the effect disappears by successive cultivation in normal media.

Bernardy prefers as an antiseptic the biniodide (1 to 4000 or 1 in 20,000) to the sublimate solutions, as recommended by Miquel,* and which Panas prefers in eye-surgery, it being less irritating than corrosive sublimate. It might also be added that there is much less danger of a mercurial impression being made upon the system by absorption where this salt is used, as the solutions usually only contain half as much mercurial.

The biniodide of mercury is not very soluble in water, but its solution may be promoted by the addition of alcohol or of an equal quantity of potassium iodide.

Mercury may be applied to the skin with a view to absorption, and for this purpose the ointment or the oleate may be used, a piece the size of a marble or larger being rubbed upon the inner side of the arms and thighs once or twice daily. The place of inunction must be changed, as the mercury causes some local irritation, and a crop of papules is likely to follow its repeated application to the same spot. A small piece of ointment may be rubbed upon the soles of the feet before putting on the stockings each morning, the friction in the act of walking being sufficient to cause absorption. In the case of infants suffering with congenital or acquired syphilis, the ointment may be rubbed upon the abdomen under the belly-band. This method is resorted to when it is desired to impress the system rapidly, as, for instance, in the treatment of the inflammatory manifestations of syphilis, especially in iritis. The constitutional effect can be most rapidly obtained in this way without disturbing the digestive organs.

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* *Philadelphia Medical Times*, vol. xvi, p. 521.

The late M. Quinquaud, of Paris, claimed that the application of a mercurial plaster over the spleen is an efficient and convenient method of administering mercury in syphilis. The preparation of which he made use was composed of 60 ounces of diachylon plaster, 20 ounces of calomel and 6 ounces of castor-oil. After thorough mixture the mass was made into plasters four inches square. The skin was washed with soap and water, a plaster was applied and left in position for eight days, when it was removed and the skin left uncovered for eight days. A second plaster was then put on and kept in place for eight days. Four or five days after the first plaster was applied mercury appeared in the urine, gradually increased in amount and reached its maximum on the eighth to eleventh day. If a second plaster was not used the metal continued present in the urine for a month or six weeks. By this alternate use and disuse of the plaster during periods of eight days ptyalism is said to have been entirely avoided.

In severe cases of secondary syphilis Dr. Dymnicki has found it of advantage to associate the internal administration of quinine with the inunction of mercury. The class of cases in which this combination proved valuable was marked by increased tissue-change. In syphilis, especially when the infiltration is marked upon the skin, the efficacy of one of the mercurial ointments may be increased by combining with some stimulating oil or green soap :—

| | | |
|---|---|---|
| ℞ Ungt. hydrargyri nitratis, | | |
| Sapo viridis, | āā | ℥iss. |
| Ol. eucalypti, | | fʒss.—M. |

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|---|---|
| ℞ Ungt. hydrargyri ammoniat., | ℥ij. |
| Olei anthemidis, | fʒss.—M. |

| | |
|---|---|
| ℞ Ungt. hydrargyri oleatis (10 vel 20 per cent.), | ℥ij. |
| Olei cadini, | fʒij.—M. |

| | |
|---|---|
| ℞ Ungt. hydrargyri oleatis (10 per cent.), | ℥j. |
| Olei caryophylli, | ♏xx.—M. |

On the basis of his clinical experience, Dr. Joseph Dymnecki advocates a combination of sulphur baths and mercurial inunction. He believes that the baths promote the action of the mercury and finds that the chemical incompatibility detracts nothing from the therapeutic effects. Watraszewsky prefers the use of calomel soap to mercurial ointment in the treatment of syphilis. The soap is made of triturating pure olive-oil soap with calomel in the proportion of one to two or three. A piece of the soap equal to 30 grains is rubbed into a selected part of the body until nothing remains but the foam. This is furthermore rubbed until it also disappears. The method is cleanly, does not irritate the skin and requires but ten or fifteen minutes for its execution. Another method of keeping mercury in continued contact with the skin is that adopted by Peroni, who adds to the solution of gutta-percha a quarter of its weight of calomel. After the patient has bathed, his back is painted with the solution and when the chloroform has evaporated a mercurial varnish remains closely adherent to the skin. This practice has been found of service when the internal use of mercury is badly borne and is suitable to children afflicted with hereditary syphilis or late cutaneous manifestations. Welander has convinced himself, by comparative experiments, that a greater quantity of mercury is absorbed by the simple application of blue ointment to the skin than when friction is employed. If rubbed upon the skin before the patient goes to bed the bodily heat vaporizes the metal which is absorbed by the skin and lungs. He advises, therefore, that an excess of the ointment should be used in order that absorption should be continuous.

Often the most rapid way to mercurialize a patient is by using the drug in the form of suppositories. Fumigation is also a method of introducing mercury into the blood by way of the skin. The usual method is to place the patient in a vapor-bath until he is perspiring freely, and then to expose the body to the fumes arising from 10 or 20 grains of calomel sublimated by the flame of an alcohol-lamp. The fumes should not be inhaled, and, therefore, the patient sitting on a chair has a blanket or his clothing fastened around his neck and extending down to the floor all around, making a canopy; under the chair is placed a small spirit-lamp, and over it, upon a sheet of tin, is placed the mercurial. The patient, after about fifteen minutes' exposure, is wrapped up in dry, warm blankets, and the skin allowed to dry spontaneously. If perspiration continue it may require a small dose of atropine. In this way the mercury is deposited upon the skin, and is gradually absorbed, producing the greatest impression with the least disturbance. This method is especially valuable in controlling the skin disorders attending syphilis (syphilides), and in the treatment of other manifestations of the poison when mercury is not well borne by the bowels. The hypodermic method of administering mercurials has been practised of late years in Germany and, to a limited extent, in this country. For this purpose solutions of corrosive chloride (hydrarg. chlor. cor., gr. j; aquæ destillatæ, f℥ij. Sig.: Ten minims a dose once a day) have been increased, minim by minim, until 50 or more are administered, or until the physiological action of the mercury is apparent. This plan of treatment is as cleanly, quick in results, and more successful, than any other in preventing relapses.

It may, however, cause irritation, and has, in some rare instances, when given improperly, led to abscess and sloughing. If the hypodermic needle be properly inserted, the instrument and needle aseptic, the author has never observed any case of abscess follow the hypodermic injection of the corrosive chloride of mercury. The moment the least mercurial impression is made by the subcutaneous injection, the dose should be reduced to the smallest amount. A few minims of the solution already named should be again injected into the muscle or skin, and the system kept under the impression of the drug by injections every day or two, until all evidence of syphilis disappears. In place of using small doses of mercury every day hypodermically, the writer sometimes, especially in lean subjects, injects from ¼ to ⅓ grain of corrosive sublimate two or three times a week into the muscular tissue of the gluteal region or back. The hypodermic method thus administered is for old cases of syphilis, especially in broken-down individuals, and offers a most positive way of limiting or curing the disease.

The mercurial, when injected in these large doses, is slowly absorbed and exerts only a therapeutic and not a toxic action.

In two cases of cerebral syphilis which had proved unamenable to treatment, Baccelli resorted to the intravenous injection of corrosive sublimate with excellent results. The solution was of such strength that 15 minims corresponded (about) to $\frac{1}{172}$ grain, and this was the amount injected to begin with, the operation being practised every day and the dose being increased to $\frac{1}{24}$ grain.

The albuminate and peptonate of mercury have been proposed with a view to obviate any accidents, but with little improvement.

The glutin-peptone sublimate, another compound used in the same manner and for the same purpose is obtained by the action of hydrochloric acid on gelatin. It contains 25 per cent. of corrosive sublimate, and is a white, hygroscopic powder, which usually assumes the form of a colorless, non-corrosive fluid. This preparation is used in doses of 15 grains, and is said not to occasion much pain or give rise to abscesses.

On the clinic of the late Auspitz the following solution was employed:—

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|---|---|
| ℞ Hydrarg. chlor. corrosiv., . . . . . . . . . | gr. xv. |
| Sodii chloridi, . . . . . . . . . . | gr. xxx. |
| Aquæ destillatæ, . . . . . . . . . . . | f℥iij. |

M. Dose, ♏x–xx every second day hypodermically.

Mathes states that no irritation results beyond a little tumefaction. About twenty or thirty injections constituted the course of treatment, which resulted in a cure. Liebreich recommends the formamidate of mercury, which does not coagulate albumin, is neutral in reaction, readily combines with water, and is not precipitated by alkalies.

**Formamidate of Mercury**[*] is prepared as follows: 10 to 13 grammes of freshly precipitated, completely washed, and still moist mercuric oxide are gently warmed with a little water in a porcelain capsule, with a gradual addition of 10 grammes of formamide (resulting from the reaction of ammonia upon ethyl formate). As soon as solution has taken place the resulting colorless liquid is filtered into a litre-flask, and the latter filled to the litre-mark with distilled water. Each cubic centimetre contains 0.01 gramme of mercury (gr. $\frac{1}{6}$), which is one hypodermic dose. It should be dispensed in brown-colored bottles. Zeissel, of Vienna, after trial of this agent, was well satisfied with it, and found twenty injections the maximum number required to disperse the syphilitic manifestations, even in severe cases. Kopp's[†] conclusions from over 3000 injections were less favorable; he says that "Liebreich's preparation is decidedly useful in certain of the milder forms of primary syphilis, as also for slight secondaries. The formamide should not be employed in severe cases where there are large papules or thick infiltrations; inunction is still the best method of treating these cases. The tertiary forms are likewise not to be treated by the formamide. Relapses are by no means prevented by Liebreich's method; on the contrary, they appear to be extraordinarily common after this treatment." In order to obtain more permanent effects than are possible by the use of the soluble preparations, it has been thought that by depositing the more stable compounds under the skin a more lasting effect can be obtained, and calomel is now used in this manner. The calomel may be suspended in liquid vaselin or olive-oil (1 in 10). There should be at least a week's interval between the injections, which are usually thrown deeply into the tissues of the buttocks or retro-trochanteric space (Besnier). The part should be washed with antiseptic solution, and the needle sterilized before each operation; the puncture should be immediately covered with emplastrum de Vigo or by a drop of collodion.* It should be pointed out that the subcutaneous injection of calomel, or other insoluble preparation of mercury, is not without danger. There is liability to the local deposit of the mineral at the point of injection, with continuous slow absorption. Embolic pulmonary infarction has occurred in direct consequence of the procedure, while in other cases a dysenteric condition was established.

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[*] "Notes on Hydrargyrum Formamidatum," by J. C. Wilson, M.D., *Philadelphia Medical Times*, vol. xiv, p. 149.

[†] *Vierteljahrschrift für Dermatologie und Syphilis*, 1885.

In France, the blue ointment (made with oil instead of fat) is used, but it has occasioned abscess and repeated attacks of stomatitis. Mercury benzoate, proposed by Stukovenkoff, has been adopted by some of the French physicians as the material for injection; 3 grains of the salt with $\frac{3}{4}$ grain of sodium chloride are added to 1 ounce of water, and of this solution about 6 milligrammes ($\frac{1}{12}$ grain) are injected daily into the buttock. Urethral injections (1 to 5000 or 1 to 10,000) of the benzoate have likewise been successfully employed in gonorrhœa.

Welander has had good results in the treatment of buboes by the hypodermic injection of this salt. The occurrence of threatened suppuration was prevented in 30 out of 33 cases. He injected at one or two points, according to the size of the tumor, 7½ minims of a fluid composed of a 1-per-cent. solution of mercury benzoate and a ½-per-cent. solution of sodium chloride. Dr. Létnik, of Odessa, after having followed this procedure with success, comes to the conclusion that the employment of any soluble mercurial salt would accomplish the same purpose. Dr. Létnik suggests that this method may prove of service in aborting acute phlegmons, suppurating arthritis and abscesses following infectious diseases.

Other mercurial preparations have been used in the same manner for the same purpose. Gray oil is much in vogue in Vienna, while the salicylate, yellow iodide, and cyanide have been experimentally employed by Roussel and Chernoguboff. Gray oil consists of mercury, lanolin, and olive-oil. A case has lately been reported in which a 30-per-cent. solution (hydrarg., lanolin, āā 3 parts; olei olivæ, 4 parts) had been used during seven weeks as a subcutaneous injection. At the date of the last injection no sign of mercurialism was present, but a week later the gums became tender, ptyalism and violent gastro-enteritis soon ensued, and in about a month the patient died.

Neumann has, in a number of cases, employed asparagin-hydrargyrate prepared by dissolving 10 grammes of asparagin in warm water and adding mercuric oxide until no more dissolves. The solution, when cold, is filtered and the amount of mercury calculated. It is then diluted to the strength of $\frac{1}{2}$, 1 or 2 per cent. This solution is a limpid, colorless fluid, devoid of odor, but possessing a sharp, acrid and metallic taste. It contains no excess of asparagin. A daily injection, generally in the interscapular region, was made of 1 c.c.m. (15 minims) of the 1-per-cent. solution, being equal to 0.010 gramme (about $\frac{1}{6}$ grain). Asparagin-hydrargyrate is distinguished by the rapidity with which it is absorbed and eliminated. The injections are well borne and accidents are rare.

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* *Revue Gén. de Clinique et de Thérapeutique*, September 12, 1889.

The succinimide of mercury is a compound concerning which a report has been recently made by Jullien. The salt occurs in the form of long needles and is very soluble in water and alcohol. He made use of a solution in distilled water, each cubic centimetre of the fluid containing 0.0025 ($\frac{1}{24}$ grain) of succinimide of mercury. From half to 1 cubic centimetre of the solution was injected every day and gave rise neither to pain nor irritation. The treatment was found efficient, most of the cases being in the secondary stage. An average of 22 injections was made in each case. No salivation was produced. The drug was, in other cases, administered by the mouth in doses of $\frac{1}{3}$ to $\frac{1}{2}$ grain with advantage, though the treatment was more prolonged.

After preliminary experiments upon animals for the purpose of determining the safety of the procedure, Baccelli, in a case of cerebral syphilis which had resisted other methods, resorted to the intravenous injection of a solution of corrosive sublimate. The solution consisted of 1 part of the mercurial and 3 parts of table salt to 1000 parts of water. Of this fluid 15 minims were thrown into one of the veins at the elbow. In the course of five or six minutes some salivation was excited. A beneficial effect upon the disease was very rapidly manifested. Baccelli suggested that intravenous injection of mercury may prove useful in other affections. The procedure has been tentatively extended by Jemma to typhoid and rheumatic fevers, erysipelas and tuberculosis. The dose of corrosive sublimate injected was always 1 milligramme ($\frac{1}{64}$ grain) to begin with, and the greatest quantity administered was 4 milligrammes. About 300 injections were made and no evil consequences were observed. They seemed to be beneficial in typhoid fever. The water was always sterilized and filtered. Every precaution was taken in order to preserve asepsis. It is possible that this mode of treatment may prove advantageous in desperate cases, but it is not free from danger and must be carried out with extreme caution.

The latest compound brought forward for hypodermic injection is the double hyposulphite of mercury and potassium, which occurs as colorless crystals, easily soluble in water and contains 31.4 per cent. of mercury. For injection 4 grains are dissolved in $2\frac{1}{2}$ drachms of distilled water and from 7 to 15 minims are employed, corresponding nearly to $\frac{1}{12}$ and $\frac{1}{6}$ grain of the corrosive sublimate.

The salicylate of mercury may be readily prepared according to the following formula of Vacher:—

| | |
|---|---|
| ℞ Hydrarg. chlor. corros., . . . . . . . . | gr. xv. |
| Sodii salicylat., . . . . . . . . . | gr. xxx. |
| Aq. destillat, . . . . . . . . . . | f ℥ iij. |

M. Each cubic centimetre (15 minims) contains 1 centigramme ($\frac{1}{6}$ grain) of salicylate of mercury.

Another mercurial salt which has been employed for hypodermic use in syphilis is the thymolacetate. The injection is said to cause but little pain and is made every eight or ten days. Dr. Tranjen makes use of the same preparation in tuberculosis.

Moncorvo and Ferreira have extended the use of hypodermic injections to infantile syphilis, using by preference the corrosive sublimate and gray oil. The former was given in doses of $\frac{1}{100}$ to $\frac{1}{33}$ grain to children varying from three months to fourteen years of age. The amount of gray oil injected is said to have been "from two-fifths to the whole of a Pravaz syringe," the ages of the patients ranging from thirty-eight days to twelve years. The result is stated to have been rapid improvement as regards the cutaneous lesions and decided gain in weight and general condition.

The writer has employed the mercurials, especially the corrosive chloride, hypodermically in the treatment of several cases of psoriasis, with a complete removal of all the eruption from the body, the dose and injection used being similar to that already described in treating syphilis. Poncel,* of the Marseilles Hospital, has also employed injections of the corrosive chloride of mercury into tumors of a cancerous appearance, followed by their complete disappearance.

Dr. R. Cowan Lees, of Glasgow, reports that he has met with some success in the treatment of sarcomata and carcinomata by injections of corrosive sublimate disolved in olive-oil. He employs the same method in pneumonic phthisis.

A case of traumatic tetanus in a child has been described by Celli, in which success followed the hypodermic injection of corrosive sublimate, as first practised by Baculo. During seven days nine injections of about $\frac{1}{12}$ grain were given. Improvement was observed from the beginning, and on the eighth day the patient was completely cured. M. Jullien states that subcutaneous injections of the same salt yield satisfactory results in gonorrhœal rheumatism.

In cases of hydatid cyst of the liver, Baccelli advises that after about an ounce of the fluid has been withdrawn a corrosive sublimate solution should be injected into the sac. Five drachms of a 1 to 1000 solution are used in this manner, and at the end of five days the parasite is dead and the symptoms steadily improve.

Mercurials are used for their local effects upon mucous membranes; for instance, in syphilitic ulceration of the tongue, lozenges of liquorice containing $\frac{1}{20}$ grain corrosive sublimate may be allowed to slowly dissolve in the mouth, and the solution being swallowed also produces its constitutional effects. In disease of the uterus and pelvic organs, Dr. L. Smith, of Montreal, uses cotton and wool tampons containing mercuric chloride, $\frac{1}{10}$ grain, in conjunction with boro-glyceride solution (10 per cent.), introduced into the vagina twice a week. These may be left in place from four days to a week without decomposing or causing irritation. They take the place of pessaries, are cleanly, convenient, and efficient in the treatment of vaginitis, endometritis, salpingitis, ovaritis, and pelvic peritonitis, and they entirely remove any unpleasant odor from discharges.†

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* *Medical Press and Circular*, September 17, 1890.

† *Canada Medical Record*, October, 1890.

Professor Guyon has employed installations of corrosive sublimate with good results in cystitis. He generally made use of solutions of 1 to 3000 or 5000, and the first installation did not exceed 20 or 30 drops. The quantity can subsequently be increased to a drachm. In tuberculous cystitis the pain was relieved. In cystitis dependent upon gonorrhœa and other causes the treatment was followed by improvement.

In ear affections an ointment of yellow mercuric oxide, 5 to 10 grains to the ounce of lard or cold cream, is much used to relieve inflammation and keep the canal clean.

In a case where a mass of molten lead had run into the ear, filling the tympanum, Mr. A. Marmaduke Sheild* succeeded in removing the impaction by filling the external meatus with liquid mercury which seemed to have a solvent action upon the lead. After apparently remaining in the ear for sixteen hours the mercury escaped, mingled with lead, and on the following day the latter metal was so softened that it could be easily removed.

An ointment of yellow oxide has been used in eye practice in the treatment of chronic blepharitis, tinea tarsi, and eczema, or by rubbing in at night a little diluted citrine ointment. The irritant properties of the red oxide render its ointment a useful application to indolent ulcers, whether of syphilitic or common origin; to enlarged scrofulous glands, or goitre, rosacea, scleroderma, and lepra. The oleate is a milder and a safer application, though less efficient. The yellow wash is a good application in scrofulous conjunctivitis. Finely-powdered calomel may be dusted over the surface of the lids in phlyctenular ophthalmia and corneal ulcerations. The subconjunctival injection of a 1 to 1000 solution of corrosive sublimate was originally practised by Darier, two minims being introduced, and very favorable results have been reported by Dr. Adolf Alt, of St. Louis,† from the use of this method in iritis, iridochoroiditis, exudative choroiditis, central chorio-retinitis, and detachment of the retina. The cases of iritis were of all varieties, including those of syphilitic, rheumatic and traumatic origin. In the treatment of corneal troubles, however, especially parenchymatous keratitis, this writer observed no beneficial action. A certain number of cases of sympathetic ophthalmia have also been reported as cured by this method of treatment. It is regarded, however, as unadapted to cases in which the stasis of the local circulation prevents, either wholly or in part, absorption of the injected fluid. Mercuric cyanide has been employed instead of the corrosive sublimate.

In granular conjunctivitis the following ointment is beneficial:—

| | | | |
|---|---|---|---|
| ℞ | Hydrarg. oxid flav., . . . . . . . . | | gr. iij. |
| | Zinci oxidi, | | |
| | Thymol., | | |
| | Cocain. hydrochlorat., . . . . . . . | āā | gr. iss. |
| | Camphor., . . . . . . . . . . . | | gr. ss. |
| | Vaselin, . . . . . . . . . . . . | | ʒvj. |

M. Sig.: Apply locally.

Before applying calomel to the eye, the physician should always ascertain whether the patient has been upon an iodine course. A caustic compound may form between the mercury and iodine and give rise to intense pain, with inflammatory swelling of the conjunctiva and lids. Cases have occurred in which this unfortunate accident has led to almost complete loss of vision.

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* *Lancet*, April 30, 1892.

† *American Journal of Ophthalmology*, February, 1894.

The ointment of the red oxide is a valuable counter-irritant and resolvent in enlarged glands, goitre, and ague-cake, the application being made in the direct rays of the sun or before a fire. This ointment may also be serviceably applied to indolent ulcers, seborrhœa, and lupus erythematosus. Ulcers, especially venereal, are stimulated by the application of diluted acid nitrate of mercury (1 to 10 or 20), but this preparation often gives rise to pain and hæmorrhage, and should be used very cautiously upon soft parts for fear of causing sloughing. It should never be used for venereal ulcers in full strength. A better method is to wash the sores or condylomata with solution of chlorinated soda, and, after drying with absorbent cotton, dust calomel, or equal parts of calomel and starch, over the surface, as practised by Ricord. The black wash also makes a good dressing in such cases and in rhus poisoning. In acne or eczema of the scalp, lotions containing 1 or 2 grains of corrosive sublimate to each ounce are much used.

Corrosive sublimate in the form of an ointment or lotion, from 2 to 5 grains to the ounce, is employed successfully for the removal of freckles.

Calomel alone or combined thus is of service in herpes and irritation around the genital organs:—

℞ Hydrargyri chloridi mitis, . . . . . . . . ʒiij.
Bismuth. subnit.,
Pulv. lycopodii, . . . . . . . . . ãã ℥ss.
M. Sig.: Dust over the surface.

Calomel is also of much value, dusted over the surface, to diminish exuberant granulations, as follows:—

℞ Hydrargyri chloridi mitis, . . . . . . . . ℥ss.
Iodoformi vel iodoli, . . . . . . . . . ʒss.
M. Sig.: Sprinkle over the ulcer or ulcerated surface.

Dr. J. B. James, of London, claims good results from the application of calomel to hæmorrhoids, especially when the tumor is inflamed.

Calomel likewise forms an ingredient of many cancer powders for destroying malignant growths upon and in the skin. Esmarch's painless powder contains calomel, and is composed as follows:—

℞ Hydrargyri chloridi mitis, . . . . . . . . gr. lxxx.
Acidi arsenosi,
Morphinæ hydrochloratis, . . . . . . . ãã gr. x.
Pulveris acaciæ, . . . . . . . . . . ℥j.—M.

For acne we may use the following:—

℞ Hydrarg. chloridi corrosiv., . . . . . . . . gr. vj.
Mist. amygdalæ, . . . . . . . . . . f℥vj.
M. Sig.: Apply night and morning.

Stronger solutions are useful in scabies, tinea versicolor, ringworm, and alopecia:—

| | |
|---|---|
| ℞ Hydrargyri chloridi corrosivi, | gr. xij. |
| Spiritus thymoli, | f ʒ ij. |
| Aquæ hamamelidis dest., | f ℥ v.—M. |

| | |
|---|---|
| ℞ Hydrargyri chloridi corrosivi, | gr. x. |
| Spiritus rosmarini, | f ℥ j. |
| Ammonii chloridi, | ʒ ss. |
| Spiritus vini rectificat., | f ℥ iv.—M. |

The ointment of the nitrate, diluted, or the mercurial ointment, have long been used upon the face in small-pox in order to prevent the development of the pocks and consequent pitting. Whether the effect is dependent upon the mercury or exclusion of light and air still remains undecided.

For the local treatment of variolous pustules, Dr. Talamon advises spraying the surface with a solution containing 15 grains each of corrosive sublimate and citric or tartaric acid, 75 minims 90° alcohol and a sufficient quantity of sulphuric ether to make 3 ounces. He makes use of the same method in the treatment of erysipelas.

A weakened citrine ointment is valuable in the topical management of ozæna. In the varieties of trichophytosis and in phtheiriasis the ointment of the nitrate is valuable. It is beneficial, moreover, in chronic eczema, psoriasis, rosacea, sycosis, and in numerous chronic disorders of the skin.

In alopecia circumscripta Dr. L. Duncan Bulkley prescribes:—

| | |
|---|---|
| ℞ Hydrarg. chlorid corros., | gr. j. |
| Terebenæ, | ♏j. |
| Lanolin, | ℥j. |

M. ft. ungt.

This formula is especially applicable to those cases believed to be of parasitic origin.

An ointment of calomel, 20 grains to 1 ounce of lard, is also serviceable in similar cases, and Ringer considers it of special service in itching affections, especially around the anus. A weak calomel ointment, 5 or 10 grains to the ounce, is of service in impetigo contagiosa and ecthyma after separation of the crusts. The latter stage of dermatitis is benefited by the use of this unguent.

The following formulæ, containing one of the mercurial ointments, may be employed in the diseases referred to above:—

| | |
|---|---|
| ℞ Ungt. hydrargyri ammoniat., | ℥ss. |
| Olei lavandulæ, | ♏xx. |
| Ungt. zinci oleatis, | ℥ss. |

M. Use in acne, rosacea, and chronic eczema.

| | |
|---|---|
| ℞ Ungt. hydrargyri nitratis, | ℥ss. |
| Olei juniperi, | f ʒ ss vel ʒ ij. |
| Lanolini, | ℥ss. |

M. For chronic psoriasis and eczema, especially of the hands and feet.

| | |
|---|---|
| ℞ Ungt. hydrargyri oleatis (20 per cent.), | ℥j. |
| Aristol., | ʒj. |

M. Serviceable in animal and vegetable parasitic diseases.

| | |
|---|---|
| ℞ Ungt. hydrargyri ammoniat., | ℥j. |
| Mentholi, | |
| Cocainæ, | āā gr. x. |
| Ol. caryophylli, | ♏x. |

M. Beneficial in herpes, herpes zoster, seborrhœa, and eczema, especially of the genital organs.

| | |
|---|---|
| ℞ Hydrargyri oxidi flav., | gr. vj. |
| Camphoræ, | gr. iij. |
| Ungt. aquæ rosæ, | |
| Lanolini, | āā ʒij. |

M. For irritable and inflamed eyelids.

Flagg recommends the red oxide combined as follows:—

| | |
|---|---|
| ℞ Hydrargyri oxidi rub., | ʒiij. |
| Cerati benzoati, | ℥j.—M. |

This preparation maintains its integrity, he adds, for many months and sometimes for years.

Its use in dental practice, says Flagg, is for the anointing of chapped lips, the treatment of sores and cracks at mouth-corners, and for the cure of fissured lips. By distending the fissures and filling them repeatedly with the ointment—*distending the fissure* with each insertion of ointment—a quality of cicatricial tissue is produced which, by its toughening, almost always prevents any subsequent fissuring.

The late Dr. Marshall employed a 5-per-cent. solution of the oleate in oleic acid, adding one-eighth part of ether, for sycosis and parasitic and itching affections. The oleates are useful where induration exists. The ointment of mercurious oleate is preferable to blue ointment in the inunction treatment of syphilis, being more elegant and cleanly, and equally efficient. This preparation is of decided value in old patches of psoriasis and chronic eczema of the palms or soles. The mercuric oleate exerts a powerful resolvent influence upon enlarged glands and upon a thickened, indurated condition of the integument. It is, likewise, curative in animal and vegetable parasitic affections.

In troublesome ulcerations of the throat, corrosive-sublimate solution is often beneficial as a local application, accompanied by other treatment suitable to the case. In diphtheria the best results are obtained by the internal administration of mercurials, conjoined with local disinfection by salt-water douches, potassium permanganate, trypsin, Monsel's solution, or boro-glyceride, instead of local applications of mercurials, since where they are frequently used it is impossible to estimate how much has been swallowed.

Rennert, however, has used with very satisfactory results in diphtheria an application to the throat of Laplace's tartaric acid corrosive sublimate solution in the strength of 1 to 500. His statements have been corroborated by Dr. M. Graham Tull, of this city. In whooping-cough, Raubitschek reports favorably of the local employment of a 1 to 1000 solution of corrosive sublimate applied upon a cotton tampon and pressed against the base of the tongue and swabbing the tonsils, uvula, and soft palate. The procedure was repeated every day or every second day with the result of materially modifying and abridging the course of the disease.

In ozæna, white precipitate may be used in the form of a snuff with white sugar, or with gum acacia and bismuth subnitrate in the strength of 4 to 8 grains to each ounce.

In chronic gonorrhœa or urethritis, irrigation of the urethra with weak solutions of corrosive sublimate (gr. i–f℥xij), used every four hours, is sometimes followed by rapid cure. A little tartaric acid should be added to the solution to keep the mercury from becoming changed into an albuminate. In gonorrhœa and gleet, injection of a solution of mercury salicylate, 1 to 4 grains to the ounce, may rapidly remove the discharge.

Professor Guyon, of Paris, introduced the practice of injecting a solution of corrosive sublimate into the bladder for the relief of tuberculous cystitis, and excellent results have been reported as obtained by the adoption of this method.

Mercurial inunction or the subcutaneous injection of corrosive sublimate is recommended as of advantage in gonorrhœal rheumatism.

In affections of the joints, orchitis, enlarged glands, an ointment containing 1 or 2 grains of morphine and a drachm of calomel in each ounce is very useful in reducing the swelling and averting threatened abscess. By the use of the Vigo plaster, compression may be made around a joint or a swollen testicle with great benefit; 2 or 3 grains of corrosive sublimate incorporated in an ounce of ointment is sometimes found of service in acne, and from 2 to 5 grains to the ounce is an effective application to freckles. An ointment of the latter strength is also useful in the ulcerated stage of lupus vulgaris. The official blue ointment is useful in erysipelas as a local application, allays inflammation in paronychia, and is a good dressing in chilblains and dermatitis. The solution of mercuric nitrate is serviceably applied to warts, chancroids, syphilitic condylomata, mucous patches, and ulcers of the mouth. The ointment of ammoniated mercury is valuable as a stimulant and resolvent.

The pyroborate is a new salt which has been used to fulfill the indications of mercury. The pyroborate is a brown, amorphous powder, insoluble in water, ether or alcohol. It has been made into an ointment (1 to 50) with vaseline, or, when designed for absorption, with lanolin.

Since fermentation is now known to play an important part in disorders of digestion, it is to be expected that the antiseptic powers of mercury would make it conspicuously useful in treating digestive disorders. When there is a foul stomach, coated tongue, some vertigo or headache, constipation, and depression of spirits,—what is commonly called a bilious attack,—10 or 12 grains of blue mass or calomel, followed in from six to eight hours by a saline purgative, will entirely change the state of affairs. It is probably true that these doses are larger than necessary, but as the excess is carried away by the saline, no harm is done. In some cases much smaller quantities given in broken doses, say $\frac{1}{10}$ grain of calomel with a little soda, given each hour until five doses are taken, is sufficient to produce the same effect if followed by a cathartic. If there is much engorgement of the liver, larger doses are preferable, and we may use with advantage the old "ten and ten" (10 grains of calomel and 10 of jalap). During the first week of typhoid fever, two or three full doses of calomel are useful in cleaning the alimentary canal and making it to some degree aseptic. This is a part of the so-called specific treatment of typhoid.

The mercuric chloride has likewise been used in the treatment of this disease, and Loranchet reports that in twenty-one cases, where this salt was the principal remedy, it caused decided amelioration of severe symptoms and apparent abatement of the toxic manifestations.

In infancy, digestive disorders are very common and they are promptly controlled by mercurials. Mercury with chalk is a common ingredient in teething-powders, but should not be used freely unless the infant suffers with congenital syphilis; for, although children are not easily salivated, yet they may be affected by the mercurial, as is shown by the peculiarity in the shape of the permanent teeth due to malformation, the result of the incautious use of teething powders containing mercury. Calomel is used for the same purpose, as well as the corrosive chloride, both of which are particularly useful in Asiatic cholera and mucous diarrhœa or enterocolitis, in small or minute doses given every hour, dissolved in recently-boiled water. In strumous children, with poor digestion and small appetite and irregular bowels, the following is a valuable tonic:—

| | |
|---|---|
| ℞ Hydrarg. chlor. corrosiv., . . . . . . . . | gr. j. |
| Tr. gentianæ, . . . . . . . . . . . | fʒv. |
| Syr. aurantii, . . . . . . . . . . . | f℥j. |

M. Sig.: A teaspoonful four times daily, at meal-times.

Dr. Thomas H. Manley, of New York, esteems mercury of value in the treatment of other scrofulous manifestations, particularly enlargement of the cervical, axillary or mesenteric glands.

In vomiting of adults and infants, $\frac{1}{100}$ grain of corrosive sublimate, or minute doses of calomel with soda or saccharated pepsin, will often check the irritability of the stomach if the diet is properly restricted. In infants having vomiting it may be necessary to stop the use of milk for a few days, and rely altogether upon rice-water or albumin-water until the digestion is normal again. The vomiting of cholera infantum is often relieved by small doses of calomel, and the nausea of adults frequently yields to the same treatment. A minute dose of calomel or corrosive sublimate, administered at hourly intervals, is advantageous in acute or chronic dysentery, soon causing the disappearance of blood and mucus from the discharges. The corrosive chloride, in doses of $\frac{1}{60}$ to $\frac{1}{30}$ grain before each meal, promotes cicatrization of a gastric ulcer. The occasional use of a mercurial purge aids in expelling intestinal worms, and, in fact, calomel is an efficient remedy against tapeworm. Given in full cathartic dose, mercury also is an excellent anthelmintic in case of lumbricoid worms. It is a common and good practice to use a mercurial in combination with santonin.

Mercury is no longer regarded as essential in the treatment of all forms of inflammation of internal organs, but small doses are valuable in promoting the absorption of inflammatory exudations, especially in glandular affections, in orchitis, in croupous pneumonia or broncho-pneumonia, tonsillitis, and meningitis. The same mode of treatment is efficacious in acute pleurisy, peri- or endo-carditis in previously robust patients.

Calomel is of special value in limiting or promoting the absorption of inflammatory exudations of serous membranes. It is also efficacious in iritis.

In dropsy due to deficient excretion, calomel, 1 grain three times daily, with squill or digitalis, will cause a free diuresis in a few days, but should not be pushed too far on account of the danger of salivation in a depressed subject. It is in dropsy dependent upon disease of the heart that the diuretic action of calomel is especially advantageous.

In ascites caused by disease of the liver, Palma obtained excellent results from the administration of calomel. The urine was greatly increased in quantity and the transudation correspondingly diminished.

In a case of hypertrophic cirrhosis of the liver, Sior observed disappearance of the jaundice, and marked reduction in the size of the liver and spleen in consequence of the use of calomel.

In the treatment of diphtheria, Dr. Daly,* of Pittsburgh, strongly advocates Reiter's method of using calomel; 2 to 5 grains being given every hour, or every two or three hours, to young children, until the discharges from the bowels appear as colorless serum, with a little greenish mucus or bile upon the surface resembling chopped spinach. Then the interval is lengthened, but the same dose continued. Shorts† gives from 5 to 15 grains every two or three hours to an adult until the greenish stools are obtained, avoiding salivation by the simultaneous administration of 5 to 8 grains of potassium chlorate. The corrosive chloride has also its advocates in this disease, and here the system tolerates comparatively large doses not only with impunity but with benefit. From $\frac{1}{40}$ to $\frac{1}{10}$ grain may be given every two hours to an infant for twenty-four to forty-eight hours, until the worst part of the illness has passed over, when the intervals can be lengthened and the dose reduced. This has the advantage of being less likely to cause salivation than the calomel. In true membranous or diphtheritic croup this plan of treatment may avert the necessity of intubation or tracheotomy. In diphtheria, Dr. E. L. B. Godfrey uses iron in combination with corrosive mercuric chloride:—

℞ Hydrargyri chloridi corrosivi, . . . . . . . gr. j.
Tinct. ferri chloridi, . . . . . . . . . . fʒij.
Syrup. simplicis, . . . . . . . . . . . f℥vj.
Aquæ, . . . . . . . . . . . q. s. ad f℥iij.
M. Sig.: A teaspoonful in water every three hours.

The yellow mercuric subsulphate is a valuable adjunct in the treatment, for 2 or 3 grains administered to a child are followed by prompt emesis and the ejection of false membrane from the throat. Fordyce Barker considers it uniformly successful in croup. It should not be allowed to remain in the stomach in case the first dose does not produce vomiting, as it may cause gastritis or mercurial poisoning; it generally is rejected too rapidly for absorption to take place.

In other constitutional diseases attended by inflammation of the throat we may give $\frac{1}{3}$ grain of gray powder three or four times a day, as recommended by Ringer. This high authority also advises the same preparation in the same dose, given hourly, in acute tonsillitis when the swollen glands interfere with deglutition and respiration.

The appended formulæ containing mercury will be of benefit in diphtheria, acute tonsillitis, and often in acute laryngitis:—

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* Transactions of American Laryngological Association, 1886.

† *Physician and Surgeon*, September, 1889; Annual of Universal Medical Science, 1890.

| | |
|---|---|
| ℞ Hydrargyri chloridi mitis, | gr. ij. |
| Antimonii et potassii tart., | gr. j. |
| Sacchari albi, | ʒ ss. |

M. et ft. chartæ no. x.
Sig.: A powder every hour or two.

| | |
|---|---|
| ℞ Hydrargyri chloridi corrosivi, | gr. j. |
| Tinct. guaiaci, | f℥ j. |
| Glycerini, | f℥ ij. |

M. Sig.: A half to a teaspoonful every two or three hours.

The sore throat of scarlatina is benefited by the administration of the gray powder, or the corrosive chloride. Petresco, after numerous bacteriological and clinical experiments, relies upon Van Swieten's solution* in the treatment of measles, scarlet fever, and small-pox. In scarlet fever the solution of the corrosive chloride was applied directly to the throat, either by penciling or in the form of a gargle.†

Mapother‡ employs mercury externally and internally in the treatment of psoriasis, the blue pill or the protiodide of mercury being usually prescribed.

In syphilis, the rôle of mercury has been considerably abbreviated in recent years. There is no denying that it does rapidly control the early manifestations of syphilis and also those of congenital syphilis, so that it may be considered, within limits, as antagonistic to the syphilitic poison. The investigations of Leon Levi show that, in syphilitic subjects, the salts of mercury favor metabolism, improve nutrition, increase the corpuscles and hæmoglobin of the blood and augment weight and muscular strength.

From a study of ninety-seven cases Welander states that during the administration of mercury in syphilis the urine contained casts, the number of which increased with the length of the treatment. After discontinuance of the remedy the casts disappeared, as a rule, within a month or six weeks without causing temporary or permanent injury to the kidneys.

As mercury is most efficient when it encounters the poison in the blood, it should be given as soon as induration is observed around the primary sore, and the treatment by small doses, avoiding ptyalism, maintained for several months. In some cases there will be no further symptoms; in others, secondaries will appear, but will be much modified. In the secondary stage the mercurial may be combined with iodides, and the tertiary manifestations are generally best treated by iodine without mercury. The mercury with chalk is preferred by Mr. Hutchinson, of London (gr. j, four times daily); Ricord prefers the yellow iodide (gr. ½, three times daily). Calomel is used by some, corrosive chloride by others. The elder Gross was fond of a biniodide made extemporaneously, as follows:—

| | |
|---|---|
| ℞ Hydrarg. chlor. corrosiv., | gr. j. |
| Potass. iodidi, | ʒ j. |
| Aquæ destillatæ, | f℥ vj. |

M. Sig.: A tablespoonful three times a day.

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* Van Swieten's solution is composed as follows: 10 grains each of corrosive sublimate and ammonium chloride, dissolved in a pint of distilled water. Dose, fʒss–j.

† Recherches Cliniques et Expérimentales sur l'Antisepsie Médicale. Par le Dr. Z. Petresco. Memoire présenté au Congrès de Thérapeutique à Paris en 1889. Jassy: Imprimerie National, 1889.

‡ "The Parasitic Nature of Psoriasis, its Treatment by Mercury," by E. D. Mapother, M.D., F.R.C.S., in *British Medical Journal*, January 17, 1891.

It may be given directly, as in the "Syrup Gibert":—

℞ Hydrarg. iodidi rubr., . . . . . . . . gr. iij.
Potassii iodidi, . . . . . . . . . gr. cij.
Aquæ destillatæ, . . . . . . . . . f ʒ iij.
Cola et adde
Syrupi, . . . . . . . . q. s. ad f ℥ x.
M. Sig.: A half to a tablespoonful three times a day.

Mercurous tannate, an odorless and tasteless salt, insoluble in the ordinary menstrua, contains about 50 per cent. of metallic mercury and is used by Lustgarten in doses of 3 to 5 grains. It is said that this combination does not salivate or disturb the digestive functions. Mercuric gallate, which contains about 37 per cent. of mercury, is said to be more stable than the tannate and to cause no mercurial intoxication.

Hurd[*] writes that the country physicians, as a rule, prefer the "mixed treatment," believing that the combination of mercury with potassium iodide is admirably adapted to secondary syphilis, and that much less mercury is needed when the mercurial is given along with the iodide.

In administering mercury for the treatment of syphilis, the author recommends the preparation or the combination with it which he deems best for each case, depending in all instances upon the patient's system. Some do best upon calomel, others upon gray powder or the corrosive chloride, while in very many instances the biniodide or blue pill acts more decidedly. One after the other of the various mercurials first named have often to be tested or combinations containing them made before the form of the drug suitable to the case under consideration can be selected and its use continued for a proper time.

The carbolate of mercury is highly esteemed by some writers, as being rapidly absorbed and capable of being given for a long time without causing salivation.

In the treatment of secondary and tertiary syphilis by mercury the author suggests the following formulæ:—

℞ Hydrargyri chloridi corrosivi, . . . . . . . gr. j.
Tinct. xanthoxyli, . . . . . . . . . . f ℥ v.
M. Sig.: Two teaspoonfuls in water three or four times a day.

℞ Hydrargyri chloridi mitis, . . . . . . . . gr. v.
Sacchari albi, . . . . . . . . . . . ʒ ss.
M. et ft. in chartæ no. x.
Sig.: A powder three or four times a day.

℞ Hydrargyri iodidi flavi, . . . . . . . . . gr. v.
Quininæ sulphatis, . . . . . . . . . . gr. xl.
M. et ft. pil. no. xx.
Sig.: A pill three or four times a day.

℞ Pilulæ hydrargyri,
Pulveris zingiberis,
Pulveris capsici, . . . . . . . . . āā gr. x vel xx.
M. et ft. pil. no. x.
Sig.: A pill three or four times a day.

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[*] "The Place of Mercury in Therapeutics," by E. P. Hurd, M.D., *Therapeutic Gazette*, January 15, 1891.

℞ Hydrargyri cum cretâ,
Pulveris glycyrrhizæ, . . . . . . . . . āā gr. x.
Creosoti, . . . . . . . . . . . . ♏j.
M. et ft. chartæ no. xx.
Sig.: From four to six powders a day.

℞ Hydrargyri chloridi corrosivi, . . . . . . . gr. j.
Tinct. stillingiæ, . . . . . . . . . . f℥ij.
Tinct. gent. comp., . . . . . . . . . f℥iij.
M. Sig.: Two teaspoonfuls in water three times a day.

Mention has already been made of the hypodermic, fumigation, and inunction methods of treating syphilis, and it is only needed to add that a drachm or two of corrosive mercuric chloride with twice as much common salt can be added to a bath for syphilitic subjects with skin-lesions. When the patient is much broken down, cachectic and anæmic, mercury should only be given in the tonic doses already mentioned; but, as a rule, the general health should be built up before putting the patient on a mercurcial course.

As a rule, the mercurial preparations should not be combined with any other on account of their affinities, which would induce changes that either lessen their efficiency or possibly make them more active than is desirable.

## **HYDRASTIS** (U. S. P.).—**Hydrastis, Golden Seal, Yellow Puccoon.**

### *Preparations.*

*Extractum Hydrastis Fluidum* (U. S. P.).—Fluid Extract of Hydrastis. *Dose*, ♏v–xxx.

*Extractum Hydrastis.*—Extract of Hydrastis (inspissated fluid extract). *Dose*, gr. ii–v.

*Tinctura Hydrastis* (U. S. P.).—Tincture of Hydrastis (20 per cent.) *Dose*, fʒss–ij.

*Hydrastina.*—Hydrastine. *Dose*, gr. ss–v.

*Hydrastinæ Hydrochloras.*—Hydrastine Hydrochlorate. *Dose*, gr. ss–v.

*Hydrastininæ Hydrochloras* (U. S. P.).—Hydrastinine Hydrochlorate. *Dose*, gr. ss–ij.

*Glyceritum Hydrastis* (U. S. P.).—Glycerite of Hydrastis.

**Pharmacology.**—The official portions of golden seal, Hydrastis Canadensis, are the rhizome and roots. It is a small plant belonging to the Ranunculaceæ, and grows in rich, moist woods, from Canada to Carolina, in the Alleghenies and westward. Its most important constituents are **Hydrastine**, a white crystalline alkaloid, not bitter, although leaving an acrid sensation in the mouth and throat, and **Berberine**, a yellow and intensely bitter crystalline alkaloid. Hydrastine is scarcely soluble in water, but dissolves in chloroform, ether and alcohol. Traces of a third alkaloid, **Xanthopuccine**, also exist, which is present in such small quantity as to be of little consequence. An alkaloid, to which the name Canadine has been given, is likewise found in the root of Hydrastis Canadensis.

It also contains a resin, starch, sugar, etc. The substance used by irregular practitioners under the name of hydrastin is an impure muriate or hydrochlorate of berberine. Both hydrastine and berberine unite with acids to form salts. The dose of the pure non-bitter hydrastine is from gr. $\frac{1}{4}$ to $\frac{1}{2}$; of the impure bitter extract hydrastin the dose is from gr. iii–x; it is unfortunate that the names are almost identical, since the dose is much smaller of the alkaloid than of the common preparation. By decomposing hydrastine with the aid of gentle heat and diluted nitric acid, a new alkaloid, **Hydrastinine,** is formed, together with opianic acid. On account of its hygroscopic properties hydrastinine is generally met with as a salt. The hydrochlorate is soluble in water and alcohol but dissolves sparingly in ether and chloroform. The experiments of Falk show that hydrastinine hydrochlorate is a highly valuable remedy. Besides the official fluid extract, which is made with diluted alcohol, as a menstruum, an aqueous fluid extract called "fluid hydrastis" is sold, which does not fully represent the root, as it is made with water and glycerin, but is an attractive and useful preparation.

**Physiological Action.**—Hydrastine is an active poison, causing convulsions followed by paralysis. Berberine is less convulsant, and has been already discussed. Hydrastis is possessed of anti-periodic qualities, though ranking much below cinchona. In small amounts it promotes appetite, increases the gastric secretions, acts as a cholagogue, and stimulates peristalsis; in larger doses it deranges digestion and causes constipation. In poisonous doses death may be caused by its action upon the nervous system, from convulsions or paralysis. Introduced into the circulation it causes rise in pressure after a preliminary fall; if in large dose, the pressure falls, the irritability of the vagus is destroyed, and the heart's action is arrested in diastole.

The physiological action of hydrastine has been studied by Serdtseff in many experiments upon cold- and warm-blooded animals. Small doses retard the heart's movements by stimulating the inhibitory apparatus, both peripheral and central. It increases and strengthens uterine action by an influence derived from the cerebral nervous system, probably by way of the vaso-motor nerves. Dr. David Cerna has determined that hydrastine destroys the irritability of muscular tissue and the excitability of motor nerves. Very large amounts produce loss of functional activity of the sensory nerve fibres and also cause anæsthesia when locally applied. Small quantities increase reflex activity by stimulating the spinal cord.

Bordet asserts, as the result of his experience, that hydrastine hydrochlorate has no influence in arresting hæmorrhage from the womb during labor or the puerperal period. The progress of involution is also unaffected by the salt.

Hydrastine seems to be absorbed slowly when given by the mouth and, according to Marfori, has a tendency to accumulate within the system after having been given for a considerable time. It has been found in the fæces as well as in the urine.

As hydrastine is eliminated chiefly by the kidneys, it exerts some diuretic action. The derived alkaloid, hydrastinine, being sparingly soluble in water, the hydrochlorate of hydrastinine has been employed, and the result of the investigation shows it to possess powers like ergot. It is used in 5- to 10-per-cent. solution, hypodermically. The injections do not cause pain and do not discolor the tissues, but they so readily control hæmorrhage, and especially uterine hæmorrhage, as to constitute this agent a rival of the preparations of ergot. Falk reported twenty-six cases of uterine hæmorrhage, receiving 400 injections in all, and considers it much more prompt and sustained in its action than ergotine.

**Therapy.**—Hydrastine hydrochlorate, 3 grains to the ounce of glycerin, Keyser reports is excellent in some cases of conjunctivitis granulosa. It is also used in nasal catarrh, and in uterine catarrh, or leucorrhœa, both internally and locally. In gonorrhœa, after the acute stage is passed, we may use hydrastin (commercial) in water (gr. v-℥j) twice daily, or ½ drachm of fluid extract may be added to ½ pint of water, and used as an injection in subacute gonorrhœa, vaginitis, and leucorrhœa. As a mouth-wash in syphilitic affections the tincture may be added to water and freely used. The fluid extract, either in full strength or diluted with water, is likewise a beneficial local remedy in mercurial or aphthous stomatitis and follicular pharyngitis. The same application may be made with advantage to fissured nipples and otorrhœa. Hydrastis and hydrastine hydrochlorate possess a sphere of usefulness in dermatology.* From 2 to 6 grains to the ounce of water, or distilled witch-hazel, makes an excellent lotion in hyperidrosis. Its stimulant effect upon the sebaceous glandular system renders it also of avail in acne and dry seborrhœa. A useful ointment may be prepared by incorporating 5 to 30 grains of hydrastine hydrochlorate in an ounce of ointment basis. Hydrastine ointment stimulates ulcers to repair and at the same time destroys the fœtor of unhealthy discharges. For this reason it may be appropriately used as a dressing upon ulcerated carcinoma and in bromidrosis. This ointment is an excellent application to chancroids and chronic eczema :—

℞ Ergotinæ,
Naphthol., . . . . . . . . . . āā ʒss.
Hydrastinæ hydrochloratis, . . . . . . gr. v vel xx.
Bismuthi subnitratis, . . . . . . . . ʒj.
Unguenti simplicis, . . . . . . q. s ad ℥j.
M. Sig.: Useful in hyperidrosis, bromidrosis, acne, and seborrhœa.

℞ Hydrastinæ hydrochloratis, . . . . . . gr. v vel xx.
Naphthol., . . . . . . . . . . ʒss.
Tinct. quillaiæ, . . . . . . . . . f℥ss.
Tinct. hamamelidis, . . . . . . q. s. ad f℥iv.
M. et ft. sol.
A lotion for hyperidrosis, acne, and seborrhœa.

℞ Ext. hydrastis fld.,
Ext. ergotæ fld., . . . . . . . . . āā f℥j.
M. Sig.: Use as a local application. In fissure or prolapse of the anus, ulcerations of the rectum, hæmorrhoids, and ulceratious or erosions of the os uteri.

Unhealthy ulcers, sloughing sores, and chancroids are benefited by the local application of the fluid extract. In affections of mucous membranes, especially of catarrhal character, hydrastis and its preparations are most efficient. In the chronic gastric catarrh of drunkards, in duodenal catarrh with or without jaundice, or chronic catarrh of the intestine with ulceration, it is an excellent remedy. As a vegetable, bitter tonic, it is employed in anorexia and convalescence from fevers.

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* See paper by the author, on "Hydrastis and Hydrastine Hydrochlorate in Diseases of the Skin," in the *Medical Bulletin* for May, 1885.

According to Fedorow the fluid extract of hydrastis, in doses of 20 drops four times daily, is an excellent remedy in the treatment of obstinate vomiting of pregnancy. Jordan* reports that in an obstinate case of membranous dysmenorrhœa 25 drops of the fluid extract of hydrastis twice daily, beginning eight days before each menstruation, was followed by a cure. In malarial attacks it is less efficient than quinine in checking the paroxysms, but is useful as a stomachic and general tonic. Hydrastis lessens the discharge of albumin in chronic Bright's disease and of mucus in catarrh of the bladder. Schatz pronounces it a useful agent in controlling hæmorrhages from the uterus. The effects of hydrastis in cancer are very probably limited to its action as a motor nerve-tonic and its stimulating effect upon the digestive organs. The reports as to the favorable action of hydrastinine in uterine hæmorrhage have been confirmed by Gottschalk, Czempin, Kallmorgen and other observers.

An analysis of sixty-four obstetric cases in which he made use of hydrastis has been published by Bossi. He administered it with success in puerperal hæmorrhage, in placenta prævia during dilatation of the os uteri, and as a prophylactic against post-partum hæmorrhage from any cause. He employed the fluid extract in large doses (100 to 200 minims daily) for several days at any period during pregnancy without ill effect upon either mother or child. Hydrastinine possesses the same hæmostatic virtue, and Dr. Paul Strassmann, from an experience of twenty-seven cases, considers it efficacious in menorrhagia and metrorrhagia. He gave it in pill form in the dose of ½ grain and hypodermically as high as 1 or 2 grains. In some cases, however, this dose proves insufficient and, in order to produce the same effect, must be repeated twice or thrice during the day.

Hydrastis is useful both in the hæmoptysis and night-sweats of phthisis and is strongly recommended by Kruse. He administered 30 drops of the fluid extract in the evening, and the result was maintained for three weeks after a short course of this treatment had been discontinued. The ability of hydrastis to control profuse perspiration, not only in tuberculosis but also in other diseases, is confirmed by Olszewski and other writers. According to the investigations of Porak, hydrastinine is of special utility in the hæmorrhages of puberty and the menopause and in those due to lesions of the appendages.

Hydrastinine has been proposed as a remedy in epilepsy, and in several cases its experimental use has been followed by a diminution in the frequency and severity of convulsions. Wild reports several cases in which the hypodermic use of hydrastinine gave rise to painful inflammatory patches in the throat.

### HYDROCOTYLE.—Water-Pennywort, Indian Pennywort.

**Pharmacology and Therapy.**—Hydrocotyle Asiatica (Umbelliferæ, Orthospermæ), a perennial creeper indigenous to subtropical Asia, Africa and America, contains a peculiar oleaginous substance termed vellarin, which has a bitter taste and a strong odor. In small doses hydrocotyle is a strong stimulant to the skin. Large doses cause headache, stupor and vertigo. This remedy has been employed in various chronic skin diseases attended by scaling and itching, in syphilitic and scrofulous lesions, lupus, psoriasis, eczema and lepra.

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* *Centralblatt für Gynäkologie*, No. 2, 1890.

An ounce of the dried leaves, made into an infusion, may be taken throughout the day. Hydrocotyle appears to exert an influence upon the genito-urinary apparatus.

### HYDROGENII DIOXIDUM.—Hydrogen Dioxide.

*Preparation.*

*Aqua Hydrogenii Dioxidum* (U. S. P.).—Solution of Hydrogen Dioxide.

**Pharmacology.**—The commercial dioxide of hydrogen is a colorless solution of this agent in water. It is, when undiluted, a syrupy fluid, destitute of odor, of a harsh, slightly acrid taste, has a specific gravity of 1.45 and is of very unstable composition. It decomposes into water and nascent oxygen, yielding 475 times its own volume of oxygen and leaving behind one volume of water. The freshly prepared official solution contains about 3 per cent. weight of the pure dioxide. This dilution is a clear fluid, having but little odor or taste, and is of a slightly acid reaction, corresponding to about ten volumes of available oxygen. The usual strength heretofore employed is called the fifteen-volume solution, because each portion of the solution yields fifteen volumes of the oxygen. It is an active oxidizing and antiseptic agent. As it decomposes when exposed to a temperature above 60° F., it must be kept in a cool place.

**Physiological Action and Therapy.**—The solution of hydrogen dioxide destroys pus and the micro-organisms which excite suppuration and coagulates the albuminoid components of the inflammatory product. It has also the property of checking fermentation. It is destructive to other pathogenetic micro-organisms and is an excellent agent for purifying drinking water. Dr. Jakovleff has ascertained by experiment that hydrogen dioxide increases the general acidity of the gastric juice and the proportion of free hydrochloric acid, but diminishes the amount of lactic acid. It produces a marked increase of the digestive power of the gastric juice. Being free from all irritating qualities, it can be poured over wounds, injected into sinuses, or into the ear, or used as a spray in ulcerations of the pharynx and of the larynx. It produces a frothing up when it encounters pus, owing to the liberation of oxygen, and the cessation of this commotion indicates the removal of all the pus. The surface of the wound or ulcer becomes blanched, but is not injured by the application. As a rule the fluid exerts an analgesic effect upon the surface with which it is brought into contact. Tubercular and mammary abscesses especially are well treated in this way. Boils, carbuncles, felons and ulcers are improved and their pain assuaged by the use of this remedy. Unhealthy or poisoned wounds and phlegmonous erysipelas receive decided benefit from the use of hydrogen dioxide. This solution is a beneficial application in cases of senile gangrene, phagedæna and syphilitic ulceration. It is peculiarly adapted for injecting into cavities, fistulas and sinuses communicating with bones or joints. This fluid, moreover, possesses the valuable property of disintegrating carious or necrosed bone and is, therefore, of service in hip-joint disease. Granular pharyngitis and stomatitis are benefited by the same application. It has been utilized with advantage for the purpose of disinfecting cavities in carious teeth, in the treatment of abscesses of the alveoli or antrum and for bleaching discolored teeth.

For the last-named purpose it is made into a paste with chalk or cuttle-bone. It enables the dentist to treat and fill at the same sitting a sensitive pulp or cavity. Dr. H. F. Brownlee, of Danville, Conn., made use of hydrogen dioxide with marked advantage in a case of empyema which was characterized by the excessive amount of pus evacuated from the pleural sac.

In ulcerative tonsillitis, fetid breath, and in some bronchial affections, a spray of dilute hydrogen dioxide is productive of benefit. A spray of this agent is likewise of utility in chronic nasal catarrh, ozæna, and scarlatinal angina. Hydrogen dioxide is a useful application in mercurial and other forms of stomatitis. It is particularly recommended by Boennecken as a disinfectant to the mouth during febrile and wasting diseases.

For comedones Unna advises the use of a preparation containing from 20 to 40 parts of hydrogen dioxide, 10 parts of lanolin, and 20 parts of vaseline. The application of the liquid is also of avail in acne. Hydrogen dioxide, on account of its bleaching properties, may be used to decolorize the dark lanugo hairs which not infrequently disfigure the faces of women. Touching them with a camel's-hair brush which has been dipped in the fluid will render them much less conspicuous, and this procedure may be resorted to when, for any reason, electrolysis cannot be performed. It is reported to produce amelioration in hay-fever and whooping-cough.

Dr. Golovin commends the action of hydrogen dioxide in various diseases of the conjunctiva and cornea. In ulcers of the cornea suppuration is diminished and healing promoted. Infiltrations undergo absorption. The remedy is of value in hypopyon, and may render operative interference unnecessary. Hydrogen dioxide is likewise beneficial in phlyctenular conjunctivitis and acute gonorrhœal ophthalmia. It has been used with good results in dacrocystitis. It is serviceable in suppurative diseases of the ear. Hydrogen dioxide has given very favorable results in the treatment of mastoid disease, being doubly beneficial by virtue of its action, both upon the pus and the bone.

In diphtheria and croup its value has been established; a two-volume solution is specially recommended in young children as a local application, and particularly after separation of the membranes in order to remove the odor and disinfect the surface.* It is stated by Dr. A. Jacobi, of New York, that in certain instances a weak solution proves irritant to the throat, abrades the mucous membrane and that it, consequently, sometimes proves detrimental in diphtheria and must be abandoned in such cases. In gynæcological practice this remedy has effected improvement in vaginitis and endometritis, and in chronic cystitis. It may be beneficially employed, likewise, in septic conditions resulting from abrasions or wounds of the female genital tract. It has been used with success in the treatment of gonorrhœa of both sexes. It is thought to be especially valuable in the chronic form of the disease. Dr. Willard Parker Worster, of New York, has obtained good results from the treatment of chancres by hydrogen dioxide. The ulcer was sprayed every day and in the interval kept covered with iodol.

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* Dr. E. R. Squibb, "On the Medical Uses of Hydrogen Peroxide," *Gaillard's Medical Journal*, March, 1889.

Dr. Wallian, of New York, has found hydrogen dioxide of advantage in the treatment of passive hæmorrhages. He suggests its use in the form of a spray for the relief of pulmonary hæmorrhage or injected in cases of hæmaturia and hæmorrhages of the lower bowel. Spraying the post-nasal passages with a 1- or 2-per-cent. or stronger solution will generally check epistaxis, even of severe type.* In carcinoma of the rectum or uterus it relieves pain and cleanses the diseased surfaces. The use of a spray of a ten-volume solution is recommended as a disinfectant of the sick-room in case of eruptive fevers and other infectious diseases.

It has been administered, well diluted, in gastric affections, and has been found useful in flatulent dyspepsia, heartburn, catarrh of the stomach and bowels, etc. It would probably be of service in the treatment of gastric ulcer. It has even ameliorated the symptoms of cancer of the stomach. Hydrogen dioxide, combined with tannin and injected into the intestine, is beneficial in chronic dysentery. Irrigation of the bowel by means of liquid soap, potash and glycerin, combined with the internal administration of hydrogen dioxide, was found by Dr. Elmer Lee to yield favorable results in Asiatic cholera. In cholera nostras, typhoid and yellow fevers, the use of this agent either by irrigation or by the mouth promises to be of superior efficacy.

Sir Benjamin Ward Richardson, of London, has employed this agent for more than thirty years, beginning at a time when it was regarded as a chemical curiosity. He has reported a case of epilepsy of long standing cured by the use of 2 drachms of a 10-volume solution twice daily in water. He advises a systematic trial of this remedy in epilepsy, especially in the Jacksonian variety. From a number of formulæ which have been published by Dr. Richardson the following have been selected :

| | | |
|---|---|---|
| ℞ Acid. tannic. pur., | | gr. x. |
| Glycerin. pur., | | f℥j. |
| Sp. vini rectificat., | | f℥ss. |
| Aq. destillat., | | f℥iv. |
| Aquæ hydrogen. dioxid. (10 vol.), | q. s. ad | f℥viij. |

M. Sig.: An antiseptic and astringent gargle.

| | | |
|---|---|---|
| ℞ Aquæ hydrogen. dioxid. (10 vol.), | | fʒiv. |
| Acid. tannic. pur., | | gr. v. |
| Aq. rosæ, | q. s. ad | f℥viij. |

M. Sig.: A useful collyrium.

| | | |
|---|---|---|
| ℞ Aquæ hydrogen. dioxid. (10 vol.), | | f℥iiss. |
| Acid. sulphuric. dil., | | fʒss. |
| Glycerin., | | f℥ss. |
| Aq. destillat., | q. s. ad | f℥vj. |

M. Sig.: Dose: one ounce, well diluted. An excellent mixture in the colliquative sweating of phthisis.

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* *New York Medical Journal*, November 26, 1892.

| | |
|---|---|
| ℞ Aquæ hydrogen. dioxid. (10 vol.), | f℥iiss. |
| Liq. morphin. hydrochlor., | fʒj. |
| Syr. tolutan., | fʒvj. |
| Aq. destill., | q. s. ad f℥vj. |

M. Sig.: Dose: one ounce, diluted with iced water.—Recommended in asthenic bronchitis and phthisis with severe cough and sleeplessness.

| | |
|---|---|
| ℞ Aquæ hydrogen. dioxid. (10 vol.), | f℥iiss. |
| Syr. codein., | fʒij. |
| Sp. vini rectificat., | fʒvj. |
| Glycerin., | fʒvj. |
| Aq. destillat., | q. s. ad f℥vj. |

M. Sig.: Dose: one ounce in iced water.—A palliative of decided value in diabetes, giving much better results than codeine alone.

| | |
|---|---|
| ℞ Aquæ hydrogen. dioxid. (10 vol.), | f℥iiss. |
| Acid. phosphor. dil., | fʒj. |
| Syr. ferri superphos., | fʒvj. |
| Glycerin., | fʒj. |
| Aq. destill., | q. s. ad f℥vj. |

M. Sig.: Dose: one ounce in iced water.—Recommended in asthenic cases. Used with marked advantage in the early stages of phthisis.

**Glycozone.**—A preparation bearing this name results from the combination of chemically pure glycerin with 15 times its own volume of ozone under ordinary atmospheric pressure at a temperature of 32° F. Glycozone is a stable compound which, as it is hydroscopic, must be kept tightly corked.

It has a pleasantly sweet taste. It is inadvisable to prescribe glycozone in combination with other remedies. Glycozone creates a feeling of warmth when swallowed, excites the secretion of saliva and stimulates the gastric secretions. Large doses cause distress or pain in the abdomen with loose and copious evacuations from the bowels. No ill effect has been observed upon the liver, kidneys or heart.

It has a stimulating effect upon granulations and a beneficial action upon diseased mucous membranes. It may be applied undiluted to wounds and suppurating surfaces. One part of glycozone to 12 parts of water has been used as an injection in chronic intestinal catarrh. In the dose of 1 or 2 drachms glycozone has been internally administered in chronic gastritis.

In the opinion of Dr. Cyrus Edson, of New York, glycozone is an excellent agent in the treatment of ulcer of the stomach. He has used it with advantage, also, in atonic and acid dyspepsia. The same writer recommends glycozone in the treatment of diphtheria, given in tablespoonful doses every third hour, the affected parts being sprayed frequently with hydrogen dioxide.

**Pyrozone.**—This name has been given to standard solutions of hydrogen dioxide in water and ether. Medicinal pyrozone contains 3 per cent. of hydrogen dioxide in water. It is used internally and externally as an antiseptic remedy. Antiseptic pyrozone is a 5-per-cent. solution in ether and is recommended as an application to ulcers, in rhinitis and diphtheria. In this strength pyrozone is used by dentists in crown and bridge work, having been found of decided assistance in arresting bleeding and keeping the parts perfectly dry. A 3-per-cent. solution is serviceable as a mouth-wash. Caustic pyrozone, a 25-per-cent. solution in ether, is an efficacious remedy in common and syphilitic ulcers, sinuses, etc. In dentistry it has been employed for the purpose of bleaching the teeth, in the treatment of dental abscesses and in pyorrhœa alveolaris (Rigg's disease).

## **HYOSCYAMUS** (U. S. P.).—**Hyoscyamus, Henbane.**

**Dose**, gr. v–x.

*Preparations.*

*Extractum Hyoscyami* (U. S. P.).—Extract of Hyoscyamus. *Dose*, gr. $\frac{1}{6}$–j.

*Extractum Hyoscyami Fluidum* (U. S. P.).—Fluid Extract of Hyoscyamus. *Dose*, ♏i–v.

*Tinctura Hyoscyami* (U. S. P.).—Tincture of Hyoscyamus (15 per cent.). *Dose*, ♏xx–ʒij.

*Hyoscyaminæ Hydrobromas* (U. S. P.).—Hyoscyamine Hydrobromate. *Dose*, gr. $\frac{1}{60}$–$\frac{1}{32}$.

*Hyoscyaminæ Sulphas* (U. S. P.).—Hyoscyamine Sulphate. *Dose*, gr. $\frac{1}{60}$–$\frac{1}{32}$.

*Hyoscinæ Hydrobromas* (U. S. P.).—Hyoscine Hydrobromate. *Dose*, gr. $\frac{1}{100}$, hypodermically.

**Pharmacology.**—The leaves of Hyoscyamus niger (Solanaceæ), collected from plants of the second year's growth, a biennial, growing in the Northern United States and in Europe. The chief constituent is an alkaloid, **Hyoscyamine**, which is either an oily liquid or in tufted crystals, yellowish or colorless; dissolves readily in alcohol, ether, chloroform and benzine. Hyoscyamine is also very soluble in water; with acids it forms permanent, crystallizable salts; its sulphate is official. It is isomeric with atropine, and probably identical with **daturine** and duboisine. **Hyoscine** is a derivative of hyoscyamine (which is composed of hyoscine and tropaic acid, according to Gnauck), and is very much more powerful, even $\frac{1}{600}$ grain producing decided effects. Hyoscine occurs in the form of an oily, alkaline liquid, having a narcotic odor, and solidifying to a crystalline mass on cooling.

The root and the seeds contain more hyoscyamine than the leaves, but their strength is more variable. The inspissated extract of the leaves was dropped from the pharmacopœia on account of its variability and the uncertainty of the dose.

Another alkaloid, recently isolated from the root of Scopolia atropoides, has been termed **Scopolamine**. It also occurs in sensible amount in henbane seed and in some kinds of duboisia leaves, as well as in small amount in stramonium seed, belladonna root, and perhaps also in other plants. Scopolamine occurs in the form of large, transparent crystals, but slightly soluble in water, readily soluble in alcohol, ether and chloroform. Scopolamine unites with acids and the halogen bodies to form salts and is split up by the action of the baryta water into scopoline and atropic acid.

**Physiological Action.**—The effects of hyoscyamus are similar to those of belladonna and stramonium, but it is more calmative and less irritant. The delirium occasioned by it is not accompanied by hyperæmia. It is sedative in painful affections of the genito-urinary organs, and exerts a mild diuretic effect. Hyoscyamus occasionally gives rise to a bright scarlatiniform rash similar to that produced by belladonna. It is carminative and laxative to the digestive tract. Hyoscyamine and, to a greater degree, hyoscine are valuable as hypnotics in disordered conditions of the mind. They lower the pulse-rate and frequency of the respirations. The heart is slightly depressed; the respiration finally is paralyzed.

As a result of various experiments Professor Kobert, of Dorpat, has failed to detect any essential difference between the action of scopolamine and that of hyoscine. He determined that scopolamine reduced appreciably the electric excitability of the brain. The symptoms of hyoscyamus poisoning are analogous to those produced by belladonna and are treated in the same manner.

**Therapy.**—In painful affections of the bladder hyoscyamus exerts a soothing influence when administered either by the mouth or in suppositories. Decided relief is given by hyoscyamus in incontinence of urine due to irritability of the bladder and in vesical tenesmus. Dyspnœa and tumultuous action of the heart, dependent upon valvular disease, are materially relieved by the exhibition of hyoscyamus. In colic of various kinds and in constipation it is beneficial, especially to correct the drastic effects of purgatives. Hyoscyamus has been given with advantage in chronic gastric catarrh.

In the pains of locomotor ataxia, and in tremor, hyoscyamus is very efficient, as it is also in delirium tremens and the delirium of fever. Irritative cough, asthma, or whooping-cough is sometimes markedly improved by it. The antispasmodic action of hyoscyamus renders it of avail in the management of chorea and hysterical convulsions.

In nervous cough the following prescription will often be found of service :—

℞ Tinct. hyoscyami, . . . . . . . . . . f℥ss.
Syrup. pruni Virg., . . . . . . . . . f℥iiiss.
M. Sig.: Dessertspoonful every third or fourth hour.

Hyoscyamus is capable of ameliorating painful maladies, such as neuralgia, especially visceral neuralgia, herpes zoster, and dysmenorrhœa. In these affections hyoscyamus may be combined with opium in order to counteract the constipating effects of the latter, or may substitute that remedy when peculiar susceptibility to its action exists.

Professor Verneuil mentions a case of obstinate neuralgia which was cured by hyoscyamine after resection of nerves and amputation had failed to afford relief. Mr. Embleton has found a combination of hyoscyamine and strychnine very useful in sea-sickness. But it is in asylum practice that the best results from its use have been obtained. Chronic mania and delusional insanity derive benefit from it. Ringer records a case where gr. j of amorphous hyoscyamine was given in acute mania, and it quieted the patient and produced sleep; but he considers it useless in delirium tremens. Hyoscyamine separates from ether in an amorphous form, which is considerably less potent than the crystalline alkaloid obtained from solutions in chloroform. Amorphous hyoscyamine may be given from $\frac{1}{6}$ to $\frac{2}{3}$ or even 1 grain. Ringer expressly states, however, that the maximum dose causes sleep so deep and paralysis so marked as to be alarming, and that smaller doses should be preferred. As a rule, much smaller doses are efficient in acute mania than in the exacerbations of chronic mania.

A case has been reported by Dr. Hugh Hagan, of Atlanta, in which alarming symptoms followed the administration of a single dose of $\frac{1}{24}$ grain of Merck's hyoscyamine. The patient was a man, 57 years of age, suffering from paralysis agitans. An hour after taking the drug he became dizzy, lost his sight entirely and subsequently complained of severe headache, with soreness of the throat and tongue. The face was flushed and he was much prostrated. The pulse was regular, respiration slightly accelerated and there was considerable mental confusion. Subcutaneous injection of $\frac{1}{4}$ grain of morphine and a little whisky relieved the manifestations within a few hours.

The amorphous hyoscyamine of commerce contains an admixture of hyoscine, and confusion has arisen, therefore, as regards the proper dose. Some authorities have asserted that the amorphous has a much more powerful action than the crystalline hyoscyamine. On account of this uncertainty of composition danger is avoided by using only hyoscyamine hydrobromate or sulphate or hyoscine hydrobromate.

Hyoscyamine has also proved of great value in recurrent mania. Murrell has found it of good service in chronic dementia, with agitation and destructiveness. It diminishes the number and violence of the attacks in epileptic mania. Hyoscine hydrobromate produces similar results in much smaller doses (gr. $\frac{1}{50}$ by the mouth, gr. $\frac{1}{100}$ hypodermically). Both of these agents have mydriatic effects, and can be used in ophthalmic practice to dilate the pupil; but duboisine is equally efficient and less expensive for this purpose, and homatropine hydrobromate safer and more reliable. Hyoscyamine in crystals is an excellent mydriatic, although amorphous hyoscyamine has been known to have an irritant effect. In exceptional instances hyoscyamine sulphate provokes painful spasm of the ciliary muscle. The contraction may be overcome by repeated distillations of the remedy until paresis is obtained. In cases of great nervous excitement and insomnia, Prof. S. B. Howell reports to the author that hypodermic injections of from $\frac{1}{150}$ to $\frac{1}{80}$ grain of hyoscine hydrobromate were usually followed, a few moments after administration, by calm slumber. Sleep generally continued for several hours, with no ill effects, as a rule, upon awakening. Slight mental disturbance was occasionally observed as the patient awakened, but even this condition rapidly disappeared. Howell further states that injections of hyoscine hydrobromate have never failed him in cases which had been upon the protracted use of morphine. Hyoscine hydrobromate may be used with advantage in doses of $\frac{1}{100}$ grain to allay the convulsions of cerebro-spinal meningitis. Hyoscine has been successfully used for the purpose of checking spermatorrhœa.

A toxic dose of hyoscine hydrobromate causes a rapid development of vertigo, followed by sleepiness, loss of consciousness and convulsions. After recovery a tonic muscular stiffness may remain for several hours.

Hyoscyamus excels belladonna and stramonium in hypnotic effect, and is consequently useful when a remedy of this character is required by children, by whom it is remarkably well borne. On the contrary, it is not well supported by aged people. A poultice may be made (leaves 2, flaxseed-meal 6, boiling water 20) and employed for the reduction of swellings and the relief of the pains of sores.

Malfilatre and Lemoine, after the use of hyoscine in sixty-two patients, most of whom suffered from some form of insanity, conclude that it is an excellent remedy in all conditions of insomnia with agitation. In some individuals it produces a temporary intoxication. In others the dose must be constantly increased in order to maintain the hypnotic effects.

Scopolamine hydrochlorate has been introduced into ophthalmological practice, and, according to the estimate of Raehlmann, is about five times as powerful as atropine. It is used in $\frac{1}{10}$ to $\frac{1}{5}$-per-cent. solutions; of the latter 6 or 7 drops may be administered daily to an adult or used every fifteen minutes during an hour and a half. Weaker solutions are employed in the case of children. Scopolamine hydrochlorate produces no unpleasant after-effects or double vision, and dryness of the throat is not caused except by very large doses. Instilled into the eye this salt has been of service in the treatment of iritis, episcleritis with infiltrations of the sclerotic, pericorneal injection, pannus, and suppurative inflammations of the anterior section of the eyeball. Raehlmann states that in five cases it caused a diminution in the size of a hypopyon. It is said that it has no influence upon intra-ocular pressure, and is especially valuable in inflammation of glaucomatous eyes. The duration of the mydriasis and the paralysis of accommodation was from twenty-four to forty-eight hours. Dr. Thomas R. Pooley, of New York, has obtained satisfactory results from the use of scopolamine, but has observed three cases in which it produced very marked toxic effects.

**HYPNAL.—Monochloral-Antipyrin.**

**Dose,** gr. xv–xxx vel ♏xv–xxx.

**Pharmacology.**—Chloral forms two definite crystalline combinations with antipyrin, mono- and bi-chloral antipyrin. The first is known as Hypnal, an oily liquid with an ether odor and chloral taste.

**Physiological Action and Therapy.**—Dr. Schmidt, of Nancy, found that 1 gramme (15 grains) is equal to about $\frac{1}{2}$ gramme ($7\frac{1}{2}$ grains) of chloral as a hypnotic; upon respiration it is about equal, while upon arterial pressure and cardiac contractions it has less effect than chloral alone. In the stomach it is more poisonous than the amount of chloral contained in it. In the alimentary tract it is split up into its two constituents.

Dr. Fraenkel prefers it to chloral because it is nearly tasteless, is devoid of irritating qualities to the mouth or stomach, and considers it an unrivalled soporific, especially when insomnia is the result of pain. It is sparingly soluble, and is given suspended in mucilage, in capsules or cachets. Mattison writes (*Medical Record*) that he regards hypnal as particularly adapted to children and to patients with phthisis, lessening fever, pain, insomnia, and unrest. He recommends the following formulæ of hypnal:—

| | |
|---|---|
| ℞ Hypnal, . . . . . . . . . . . . . . | ♏xv. |
| Alcohol, . . . . . . . . . . . . . . | ♏xi. |
| Elixiris vel syrupi, . . . . . . . . ad | ♏ccxl. |

M. Sig.: One dose; to be followed by one-third of a tumbler of water.

℞ Hypnal, . . . . . . . . . . . . ♏xxx.
Mucilag. acaciæ, . . . . . . . . . . . f℥j.
M. Sig.: One injection.

℞ Hypnal, . . . . . . . . . . . . . ♏xv.
M. Sig.: One dose, hypodermically.

**HYPNONE.—Phenyl-methyl-acetone.**

**Dose,** ♏v–x.

**Pharmacology and Therapy.**—Hypnone is a colorless fluid, insoluble in water or glycerin, and possesses an aromatic odor. Hypnone is very soluble in alcohol, ether, chloroform, benzine, and certain oils, as the oil of sweet almonds. It has been hypodermically employed. It is preferably administered in capsules. It has some hypnotic power, and is eliminated by the lungs and kidneys. In large doses it causes coma and paralysis of heart and respiration. Hypnone is thought to be especially adapted to the insomnia of alcoholism. Hypnone is likewise regarded as an excellent sedative in mental affections and nervous insomnia.

**HYSSOPUS.—Hyssop.**

**Dose,** gr. ii–v.

**Pharmacology and Therapy.**—The herb Hyssopus officinalis (Labiatæ) contains about ½ per cent. of a volatile oil, with tannin and a bitter principle. It is stimulant, carminative, and sudorific, and is given in solid or fluid extract in stomach disorders, recent colds, etc.

**HYSTERIONICA.—Hysterionica.**

**Pharmacology and Therapy.**—The Hysterionica baylahuen (Compositæ) is a native of South America. It is a perennial plant with oval leaves, bears a yellow flower, and contains an ethereal oil having the specific odor of the plant; a greenish-black resin, also of the same odor; gum, and glucose. The resin is excreted by the kidneys, the oil by the lungs. Dr. G. Baillé* reports that the infusion is an excellent remedy in diarrhœa, and it has produced good results in both acute and chronic dysentery. The infusion is said to be of service as a stomachic tonic, and is likewise reputed to possess emmenagogue properties.

It has also been proved useful in the diarrhœa of phthisis or cancer. Hysterionica allays inflammation of the bronchial mucous membrane, lessens expectoration, and quiets cough without causing sickness of the stomach. It promotes the action of the kidneys and diminishes the offensive odor of the urine in vesical catarrh. This remedy increases the acidity of the urine, seems to be without effect upon the perspiratory glands, and assists the healing of wounds. It may be used as a vehicle for remedies like the mercurials in order to prevent the production of diarrhœa. Given in alcoholic tincture it does not produce constipation.† The tincture is made by macerating 100 parts of the drug in 500 parts of 90-per-cent. alcohol for ten days, and its dose is from 15 to 35 drops.

**ICHTHYOCOLLA** (U. S. P.).—**Isinglass, Fish-Glue.**

*Preparation.*

*Emplastrum Ichthyocollæ* (U. S. P.).—Isinglass-plaster, Court-plaster.

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* Paris Letter, *Therapeutic Gazette*, September, 1890, p. 640.

† *Therapeutic Gazette*, vol. xiii, p. 287.

**Pharmacology.**—The swimming bladder of Acipenser huso and of other species of Acipenser (class, Pisces; order, Sturiones), or, more definitely, the inner membrane of the swimming bladder, which is generally spread out in drying, forming flat sheets, or *leaf-isinglass.* The kind imported from Russia is the most valued. Chemically, it is an exceptionally pure gelatin, known to chemists as glutin; it is free from odor and taste, and is soluble almost without residue in boiling water and in boiling diluted alcohol. Isinglass does not dissolve in cold water, as gelatin does, and, therefore, is a valuable constituent of cements. Both are precipitated by tannin.

**Therapy.**—Isinglass is used for clarifying infusions, and may be boiled with milk for internal use in bowel disorders. A codliver-oil jelly is made by means of isinglass, according to the formula given by Dr. Whitla in his excellent work on Materia Medica:—

| | |
|---|---|
| ℞ Olei morrhuæ, | f℥v. |
| Ichthyocollæ, | ʒij. |
| Pulv. sacch. alb., | ℥iss. |
| Olei amygd. essen., | ♏iv. |
| Olei pimentæ, | ♏iv. |
| Olei cinnamomi, | ♏iij. |
| Aquæ, | f℥j. |

M. This preparation is sometimes taken readily by children, and can be given in teaspoonful doses, alone or in milk, orange-juice, etc.

The well-known court-plaster, spread on silk, affords a convenient method of approximating small wounds and excluding the air; the addition of an antiseptic, like salicylic acid, is an improvement, forming salicylated isinglass-plaster.

**IGNATIA.—Ignatia, Bean of St. Ignatius.**

**Dose,** gr. i–ij.

*Preparations.*

*Tinctura Ignatiæ.*—Tincture of Ignatia (10 per cent.). *Dose,* ♏ii–x.
*Extractum Ignatiæ.*—Extract of Ignatia. *Dose,* gr. $\frac{1}{6}$–$\frac{1}{2}$.
*Extractum Ignatiæ Fluidum.*—Fluid Extract of Ignatia. *Dose,* ♏i–ij.

**Pharmacology.**—The seed of Strychnos Ignatii (Loganiaceæ) contains two alkaloids, both highly poisonous, **Strychnine** and **Brucine** (from .5 to 1.5 per cent. of each). Strychnine and strychnine sulphate are official. (See Nux Vomica for physiological action.)

**Therapy.**—The medicinal uses are the same as those of nux vomica, except that the dose should be smaller. Ignatia is employed almost exclusively for the preparation of the alkaloids.

**ILEX.—Holly.**

**Pharmacology.**—The leaves of several American species of Ilex contain **Caffeine,** and may be used as substitutes for the Camellia thea. In the Southern United States, the Ilex cassine (Aquifoliaceæ) is used in this way to some extent, but the Brazilian holly, Ilex Paraguayensis, is much richer in caffeine, and is extensively used in South America, in recent infusion, where it is known as maté or Paraguay tea. The maté is the gourd in which the infusion is made by pouring upon the leaves successive quantities of boiling water. The following analysis will show the analogy and the slight differences between the Ilex and tea and coffee; it was made by Dr. T. Cranstoun Charles:—

| | Caffeine. Percentage. | Tannic Acid. Percentage. | Ash. Percentage. |
|---|---|---|---|
| Tea, | 3.1 | 22.7 | 5.8 |
| Roasted coffee, | 1.2 | 5.8 | 4.6 |
| Maté, | 0.79 | 21.9 | 4.1 |

Besides these constituents there are small amounts of volatile aromatic oils, empyreumatic products, etc., which modify the effects of each upon the system, and upon different individuals. In the main, however, the effects of maté are those of caffeine.

**Physiological Action and Therapy.**—Charles found holly stimulant to the brain and also to the sympathetic system; the contractions of the muscular tissue of the heart and of the bladder and intestines were increased, and the whole muscular system stimulated to increased labor and wakefulness. Ilex augments the flow of urine and amount of urea and phosphoric acid. At present its therapeutic applications seem limited to the treatment of headaches accompanied by constipation, especially when tea and coffee do not agree.

**ILLICIUM** (U. S. P.).—**Illicium, Star Anise.**

**Pharmacology and Physiological Action.**—The Illicium verum (Magnoliaceæ) is a native of China and Siam; its fruit, which is official, contains a pleasant aromatic volatile oil resembling that of anise, and also some fixed oil. Two spices, I. floridanum and I. parviflorum, are natives of this country, being found in Florida and adjacent States. The Japanese variety, Illicium religiosum, contains a much smaller quantity of the oil, besides a crystalline substance called *sikimin* or *shikimi*, which is poisonous; so that dangerous results have followed the substitution of the latter for the official, such as violent epileptiform convulsions with cyanosis, ending in death. Illicium is one of the sources of the oil of anise; and, in fact, it is the chief source. Dr. E. Barral has isolated a poisonous glucoside from the kernel of Illicium parviflorum, which is not in the pericarp. The decoction of the seeds produces attacks of gastric irritation and vomiting, followed by paralysis, anæsthesia, convulsions, and death, if the dose be sufficiently large.

**Therapy.**—The medicinal virtues are similar to those of anise and other carminatives. The crushed seeds are applied externally to allay the pain of earache, colic, rheumatism, etc. It also has some reputation in Germany in the treatment of bronchitis, prepared as a tea; although this form of administration is not recommended.

**INDIGO.**—**Indigo.**

**Pharmacology.**—Indigo is a vegetable coloring agent, obtained from several species of Indigofera (Leguminosæ), of India. It is precipitated from the juices of these plants by macerating the green twigs and leaves and developing a kind of fermentation process. It is sold in masses of a blue or purplish color, and should contain from 70 to 90 per cent. of **Indigo-blue** or **Indigotin.** Indigo is insoluble in water and alcohol. The sulphate of indigo is a pasty mass and mixes with water, forming liquid blue. Used chiefly as a coloring agent and in solution for chemical tests.

Dr. J. L. Jones has used indigo with advantage in thirteen cases of amenorrhœa. He prescribed 2 ounces of indigo mixed with ½ ounce of bismuth subnitrate, and gave one-half teaspoonful in water three times a day. Under its administration the urine becomes brownish-green in color and acquires an offensive odor. The stools are liquid and have an obnoxious smell.

### INGLUVIN.

**Dose,** gr. v–xx.

**Pharmacology.**—Ingluvin is prepared from the gizzard of the domestic fowl. It is a soft powder, yellowish-gray in color, and possessing a faint odor. It is almost devoid of taste. Ingluvin is insoluble in water and the usual menstrua. It can be administered stirred into water or milk. Ingluvin can be conveniently given to children spread upon bread and butter. The powder has the advantage of being compatible with alkalies. Its virtues depend upon the presence of a peculiar bitter principle.

**Therapy.**—Ingluvin is of special benefit in the relief of sick stomach. As it is free from irritant properties it may be given with advantage when vomiting depends upon organic affections of the stomach, as acute and chronic gastric catarrh and gastric ulcer. Nausea due to disease of other abdominal or pelvic viscera, as the liver, kidneys, uterus and ovaries, is likewise relieved by the administration of this remedy. Ingluvin allays the gastric irritability which accompanies tabes mesenterica and marasmus.

It has been found of service in relieving vomiting produced by the abuse of alcoholic liquors. It is of advantage in sea-sickness and in the relief of the gastric irritability of bottle-fed babes. In the vomiting of pregnancy it approaches the character of a specific. Ingluvin is beneficial in dyspepsia when produced by functional inactivity. It checks diarrhœa caused by indigestion. By reason of its influence upon the stomach and bowels it is of service in cases of cholera infantum and cholera morbus.*

### INULA (U. S. P.).—Inula, Elecampane.

**Dose,** gr. xv–ʒj, in infusion.

**Pharmacology.**—The root of Inula helenium (Compositæ) contains a crystallizable substance called Helenin, Alantic anhydride, and Alant-camphor; also crystalline bodies and Alantol, a yellow liquid. Alantic camphor, in taste and smell, suggests peppermint. It is difficult to isolate these substances in quantity, and the alantic anhydride probably differs from helenin only in being less oxidized. Helenin presents itself in the form of colorless crystals, free from odor, insoluble in water, soluble in boiling alcohol, ether, and oils. Alantol is a yellowish, oily fluid, having an odor and taste resembling that of peppermint, soluble in alcohol and boiling at 392° F.

The substance which has lately been used to some extent in medicine under the name of helenin appears to consist of the camphor, the anhydride, and helenin proper. Elecampane also contains some bitter extractive, and about 20 per cent. of Inulin,—a peculiar kind of starch not colored blue by iodine. Inulin occurs in the form of a white, crystalline powder. It is hygroscopic, without odor or taste, slightly soluble in water, insoluble in alcohol and, chemically, appears to be the anhydride of levulose. C. Tanret has separated two substances resembling inulin and which he designates as pseudo-inulin and inulenin.

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* See paper by author on "The Clinical Application of Ingluvin" in the *Medical Bulletin*, June, 1893.

**Physiological Action.**—The active principles of elecampane have been the subject of an investigation by Mr. T. J. Bokenham.* Korab, in 1885, had found that the drug inhibited the development of tubercle bacilli, while Baeza stated that, added to the urine, it prevented putrefaction; that it diminished all the secretions, but especially those of the trachea and larynx. In small doses it was said to prevent the sialagogue and diuretic action of jaborandi. Bokenham has demonstrated that any of the crystalline constituents of elecampane will prevent the growth of the tubercle bacillus if present even in the proportion of 1 to 10,000. The result was the same in the case of all the solid nutrient media usually employed in bacteriological experiments. Liquid media containing large quantities of bacilli in suspension become, upon addition of helenine, incapable of producing tuberculosis, or even an enlargement of the nearest lymphatic glands, when inoculated into healthy guinea-pigs. In studying its effects upon other organisms, Bokenham found that rapidly-growing microphytes were practically unaffected by the presence of even 1 part of the drug in 1000 of the nutrient medium. On the other hand, the streptococci pyogenes, streptococci erysipelatis, and bacillus typhosus refused to grow on these prepared media. In experiments upon guinea-pigs, no ill effect was produced by the drug itself, however great the daily dose administered. In no case was the course of the disease following inoculation with virulent material arrested, although it was considerably retarded. The writer cited does not consider himself justified in stating that any one of the constituents of elecampane-root possesses greater value than the mixed product. According to Marpmann, the excretion of urine and uric acid is increased by inula, and he, therefore, suggests that it may prove useful in chronic gout.

**Therapy.**—From its influence upon tubercle bacilli, it is possible that helenin may prove useful in the treatment of tuberculosis. A few clinical experiments have been made, but a sufficient length of time has not elapsed to warrant any decisive conclusion as to the results.

Good effects have been reported from its use in malaria, catarrhal diarrhœa, whooping-cough and chronic bronchitis. On account of its antiseptic properties crude helenin has been employed as a surgical dressing with alleged benefit. Helenin is said to exercise a favorable influence also upon tuberculous diarrhœa.

Hamonic has reported very good results from the use of helenin in uncomplicated leucorrhœa. Applied locally, it irritates the vaginal mucous membrane, but, given by the mouth, it exerts a special influence upon the glands of the cervix uteri. A few doses cause the disappearance of the glairy discharge of catarrhal endometritis. Hamonic has given the drug in the form of a pill containing about $\frac{1}{6}$ grain of crude helenin, two to four pills to be taken in the twenty-four hours.

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* *British Medical Journal*, October 17, 1891.

Inulin has been used, in the dose of 1 or 2 grains, in dyspepsia and chronic pulmonary affections. An inulin bread has been prepared for the use of diabetic patients. This principle has also been administered in whooping-cough.

Alantol has been given in the dose of $\frac{1}{6}$ to $\frac{1}{3}$ grain, repeated every hour or two, in chronic bronchitis and pulmonary tuberculosis.

The powdered root of elecampane is used in decoction (℥ss–Oj), sweetened and flavored, which is taken freely as a diaphoretic and expectorant in chronic bronchial and pulmonary affections, dyspepsia, dysmenorrhœa, etc. It has been used, both internally and externally, in eczema and psoriasis.

## IODOFORMUM (U. S. P.).—Iodoform.

**Dose,** gr. ii–v.

### *Preparation.*

*Unguentum Iodoformi* (U. S. P.).—Ointment of Iodoform (10 per cent.).

**Pharmacology.**—Iodoform was discovered by Serullas in 1822, and introduced into medicine in 1837 by Bouchardat, and also by Dr. R. M. Glover, of London. It is produced by the action of iodine in the presence of alkalies upon alcohol, aldehyde, ether, acetic ether, methylic alcohol, and in minute quantities when acting upon carbohydrates or proteid compounds. Its formula is $CHI_3$. It occurs in yellow, scaly crystals, having the odor of saffron. It is insoluble in water, but soluble in alcohol, ether, and the fixed and volatile oils. By a temperature of above 239° F. it is fused and decomposed, giving off violet vapors. It is prepared usually by treating an alcoholic solution of potassium iodide with lime. Iodoform has a sweetish taste and a peculiar, penetrating odor, which adheres persistently to the vessels in which preparations of it have been made, and to the clothing and hands of those who use it. Many attempts have been made, with more or less success, to mask the peculiarly offensive odor of this substance. The essential oils, balsam of Tolu or of Peru, musk, Tonka bean, menthol, eucalyptol, thymol, naphthalin, tar, and creolin have all been used for this purpose. Lindermann's mixture consists of iodoform 1, balsam of Peru 3, and vaselin 8 parts. Instead of vaselin 12 parts of alcohol, glycerin, or collodion may be employed. Iodoform mixed with 1 or 2 per cent. of creolin and well triturated presents itself in the form of a light-brown powder, having a faint, aromatic odor and soluble in alcohol and ether. This powder has been applied with success by von Jaksch to fulfill all the indications of iodoform.

Pulvis iodoformi dilutus (N. F.) contains iodoform 2, boric acid 3, naphthalin 5 parts, with oil of bergamot q. s. It is in a fine powder, and the odor is entirely masked. The iodoformum aromaticatum (N. F.) contains 4 per cent. of coumarin. Other expedients which have been suggested are the addition of a small quantity of the oil of citronella or mixture with recently-ground coffee. One of the best is that discovered by Shufelt, of dissolving the iodoform in the volatile oil of camphor.

This combination was used both as an ointment and a paste. If preferred, the odor of camphor can also be removed by the admixture of either oil of bitter almonds or Canada balsam. According to Pagenkopf, the addition of a small quantity of Russian turpentine-oil imparts a peculiar and not unpleasant odor. Klingmann endeavors to accomplish the same purpose by preparing a solution of iodoform in olive-oil. He adds 1 part of iodoform to 6 parts of olive-oil and shakes for twelve hours. The clear saturated oil filtered off contains about 3 per cent. of iodoform.

The odor of iodoform may be removed from utensils or the hands by washing with a watery solution of tannic acid. Dr. W. Washburn, of New York, points out that as chloroform and ether are solvents of iodoform they may be successfully used in order to remove the odor of that substance from the hands, nails and clothing. Bienert states that washing the hands once or twice with flaxseed-meal in water causes rapid disappearance of the odor of iodoform.

Iodoform is very volatile, and should be kept in well-stoppered bottles in a cool place.

**Physiological Action.**—Applied to the sound skin, to mucous membranes, or to ulcers, iodoform (although containing 29 out of 30 parts of iodine by weight) is not in the least irritating, but, on the contrary, blunts sensibility and acts as a local anæsthetic. Iodoform produces the same effect upon mucous membranes, particularly those of the rectum and vagina. Exceptions to this rule, however, occasionally occur. Dr. Edward Martin has, for instance, reported five cases of leg-ulcers which were decidedly aggravated by the use of iodoform as a dusting-powder. In two cases observed by Hahn a vesicular eruption followed the topical use of this drug, and a case of generalized urticaria, due to the local use of iodoform, has been reported by Dr. C. H. Powell, of St. Louis, Mo.

Internally, in doses up to 5 or 6 grains, it produces no symptoms, except slight increase of appetite; iodine appears in the urine and saliva within two hours and traces continue for several days. In larger doses, iodoform produces decided narcotic effects in dogs, with inco-ordination and staggering, convulsions, and death. In man, poisonous effects have followed its very free use in wounds, the principal symptoms being prostration, headache, faintness, and persistent iodoform taste in the mouth. The temperature is affected, being increased to 104° F. or more; the pulse becomes soft, feeble, and rapid. The face may be flushed, the pupils contracted and the respiration stertorous. Delirium and suicidal mania have also been noticed. Several cases of death have been caused in this way, preceded by great anxiety and restlessness and sudden collapse. In a few instances amblyopia has been observed in consequence of the absorption of iodoform. Mr. Priestley Smith has described the case of a patient in whom toxic amblyopia developed after having taken 1000 grains in forty-one days.

In cases of death from this substance the kidneys, liver, heart, and voluntary muscles have been found in a state of fatty degeneration. There is no doubt that in some patients an idiosyncrasy exists with regard to iodoform, just as there is with regard to the other iodides. In a case witnessed by Demme, chorea appeared as one of the manifestations of iodoform poisoning. A severe general dermatitis, followed by desquamation and accompanied by a profuse diarrhœa, was observed by Kloman in consequence of the application of iodoform to a chronic leg-ulcer. Urticaria has been witnessed as a result of the external use of iodoform, and its administration internally has been known to produce a purpuric eruption.

The first step in the treatment of toxic symptoms is the prompt removal of the iodoform from the body in order to prevent further absorption; in many cases this is all that is necessary. As remedial agents, stimulants are required, and elimination favored, by sponging the skin frequently with warm water and alcohol, and the administration of mild diaphoretics. It is especially advised that iodoform should not be used with carbolic acid; that only small quantities should be dusted over the wound; that close sutures and tight bandages be avoided and free drainage maintained. As some specimens of iodoform have been found to be adulterated and colored with picric acid, bad results might be due to this cause. Potassium bicarbonate, given hourly in the dose of 10 grains, is said to counteract the toxic effects of iodoform.

The potassium bromide is also regarded as antidotal, not only as a neutral potash salt, but also by virtue of its specific bromide action, and the fact that it excels all other salts as a solvent for iodoform. Iodoform escapes by the breath under its own form, and by the urine as iodide with a little iodate.

**Therapy.**—The anæsthetic and antiseptic qualities of this agent make it a useful application, especially in gunshot and infected wounds, chancroids, phagedæna, and sloughing ulcers. It acts as an antiseptic, not by destroying bacteria, but by sterilizing the soil in which they might develop, and, possibly, by neutralizing or destroying bacterial products. Either in the form of powder or the official iodoform ointment, it is valuable in bed-sores, lupus vulgaris in the ulcerative stage, enlarged or ulcerated scrofulous glands.

An antiseptic and sedative combination, praised by Cavvazanni, is as follows—:

℞ Pulv. iodoform., . . . . . . . . . ℥ij.
Pulv. acid. salicylic.,
Bismuth. subnitrat., . . . . . . . āā ʒvj.
Pulv. camphor., . . . . . . . . . ʒjss.
M.

Iodoform constitutes a serviceable application also to syphilitic lesions. The ointment reduces inflammatory action in buboes and may prevent suppuration. It is at times attended with very good results in chronic eczema, and has been recommended in prurigo. In half or quarter strength this ointment is useful in ophthalmia and granular lids. An ointment composed of 1 to 5 grains of iodoform rubbed up with an ounce of excipient is recommended as an effective application in pannus, corneal ulcers, trachoma and chronic conjunctivitis.

An ointment composed of 150 grains of iodoform and 225 grains of carbolic acid to the ounce of excipient is a serviceable local application in nasal catarrh.

Iodoform diminishes the pain of ulcerated carcinoma. In cancer of the womb, a bolus is recommended by Ringer containing from 8 to 16 grains of iodoform incorporated in cacao-butter. This suppository can be deposited in the cavity of the malignant ulcer. The swelling and pain of orchitis are diminished by the application of iodoform ointment. A saturated solution of iodoform in chloroform relieves the pain of neuralgia and chronic gout.

It is a useful application, in the form of ointment or soluble bougies, to the urethra in the treatment of gleet or chronic gonorrhœa. P. Thierry finds it useful in the acute stage of gonorrhœa. He injects thrice daily a mixture of 1 part of iodoform and 6 parts of oil of sweet almonds. In painful affections of the rectum and bladder, fissures, hæmorrhoids, suppositories of iodoform containing 5 grains afford great relief.

An iodoform suppository is likewise recommended for the relief of chronic prostatitis.

Its solution in ether (1 to 4), kept in red-glass bottles, is a valuable agent in treating ulcers of the mouth and throat. It has been shown by P. Carles that a saturated solution of iodoform in ether is very unstable, liable to sudden decomposition, the liquid assuming a reddish color as a result of the liberation of iodine. The addition of alcohol and absence of light retard this change. Combined with tannin and triturated together, iodoform is a good astringent for soft hypertrophies in the nose, or insufflated into the pharynx for post-nasal catarrh, and into the nasal chambers for ozæna. Finely powdered iodoform, used by insufflation, is a good application in laryngeal tuberculosis, relieving hoarseness and pain.

In order to overcome the practical difficulties in the application of powdered iodoform to tuberculous ulcers of the larynx, Dr. Siemon proposes that it be administered by inhalation. He employs a solution of iodoform in essential oils. An inhalation flask being half filled with ordinary turpentine-oil, 10 or 15 drops of an iodoform solution are added and this quantity is inhaled three or four times a day.*

The following emulsion is recommended by L. Frey as an injection for cystitis :—

| | |
|---|---|
| Iodoform., | 50 parts. |
| Glycerin, | 40 " |
| Distilled water, | 10 " |
| Tragacanth, | 25 " |

A teaspoonful of this mixture is added to a pint of warm water, and, after being shaken thoroughly, used as an injection. The procedure is repeated every three days until four injections have been given, after which once a week will suffice. Professor Billroth obtained most gratifying results from the use of an iodoform emulsion in cold abscess and tuberculous caries. His mixture contains 10 grammes of pulverized iodoform in 100 grammes of glycerin. After the most scrupulous antiseptic precautions, the abscess is cut down upon and opened, the carious bone is scraped thoroughly, and the cavity in each case cleansed. The inner surface of the abscess-wall is firmly rubbed by a large pledget of iodoform gauze, the wound is then stitched up, except a large opening through which the emulsion is poured into the cavity of the abscess or the bone. Recovery sometimes takes place by the first intention. Usually a second dressing is soon required; drainage-tubes are inserted, the deep parts close by first intention, and the superficial granulating wound heals under an ointment. In other cases more suppuration occurs and recovery is less rapid, or, perhaps, the operation must be repeated. The most forbidding cases of large abscesses, with numerous fistulæ, yielded the best absolute results. He applied the same method to the treatment of echinococcus cysts, but adds the caution that if the cavity is very large there is danger of iodoform poisoning. This procedure is also of vâlue in the tuberculous joint disease of children and adults. Dr. K. Garré, of Tübingen, reports favorable results in goitre from the interstitial injection of iodoform, dissolved in olive-oil and ether.

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* *Provincial Medical Journal*, Sept. 1, 1892.

A 4-per-cent. solution of iodoform in spirit of turpentine has been found useful, administered in the form of inhalation, for laryngeal or pulmonary tuberculosis and bronchorrhœa.

℞ Iodoform., . . . . . . . . . . ʒj.
Ol. terebinth., . . . . . . . . . . f℥j.

Administer from 3 to 5 drops by inhalation in phthisis and bronchiectasis with high temperature.*

Shufelt's combination of iodoform and volatile oil of camphor has given good results when inhaled in bronchiectasis and phthisis. Chibret states that iodoform, freely sprinkled in the sick-room, diminishes the number of paroxysms in whooping-cough and shortens the course of the disease.

Kapper has advantageously employed injections of iodoform in the treatment of goitre. He makes use of a solution of 1 part of iodoform in 7 parts each of ether and olive-oil.

It may merely be added, in conclusion, that in children intoxication rarely occurs as a result of the local use of iodoform, but that old people are very susceptible to its action.

For venereal sores :—

℞ Iodoform., . . . . . . . . . . ʒj.
Ol. camphoræ,
Acid. salicylic., . . . . . . . . . āā ʒiv.
Amyli, . . . . . . . . . . . q. s.
M. Sig.: Make a stiff paste for application to ulcerated surface.

It can also be obtained combined with dressings, as iodoform gauze, cotton, or wool, for use as tampons. When applied to the surface of the body dissolved in collodion, it reduces temperature. In cancer of the breast, iodoform in powder, or in ointment, markedly relieves pain and renders the progress of the disease slower.

Internally, iodoform has been employed as an alterative and as a means of bringing the system under the effects of iodine in phthisis, scrofulous affections, and liver disorders, but has not always fulfilled anticipations. Dr. Whitla speaks in very favorable terms of the internal use of iodoform in phthisis, confirming the reports of Dreschfeld and other writers. It is administered in pills, together with extract of gentian or other stomachic tonic. The same combination has been employed in hæmoptysis with the most satisfactory results by Chauvin and Jorisenne. They have seen it succeed where ergotin had failed. If considered judicious, tannin may be incorporated in each pill. Thus given, it creates no gastric irritation. Dr. Gavoy reports decided amelioration of tuberculous bronchitis from the hypodermic injection twice daily of a quarter of a syringeful of a solution of 1 part of iodoform in 100 parts of oil of sweet almonds. In some cases of neuralgia the internal administration of iodoform has given relief.

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* Dr. Powell, *Quarterly Bulletin of Clinical Surgery* of N. Y. Post-Graduate School.

Some writers regard it of service in catarrhal jaundice and the early stage of cirrhosis of the liver. In constitutional syphilis iodoform has failed to approve itself as a superior remedy. In gastric catarrh iodoform renders service in checking fermentations, but its powerful odor renders it objectionable to patients. Drs. Lardier and Pernet have obtained good results in dysentery from the administration of iodoform in daily doses of 4 to 6 grains, given in capsules with opium. Favorable reports have been made by Professors Moleschott and Bozzolo concerning the use of iodoform in diabetes. The remedy was given in daily doses of 8 grains. Other observers have failed to confirm these results. In 1-grain doses it has been used by Professor Sim and others in cases of tænia and ascarides.

**Di-iodoform.**—This is another substance which has been brought forward for the purpose of obtaining the benefits of iodoform without the disadvantages pertaining to its offensive odor. Di-iodoform is a definite iodide of carbon, and is derived from ethylene or olefiant gas. It is a yellow substance, almost free from odor at ordinary temperatures, melting at 377.6° F., decomposing into its constituents under 392°. Di-iodoform contains 4.62 per cent. of carbon and 95.38 per cent. of iodine. It volatizes when heated, and can be sublimed. Di-iodoform is insoluble in water, and slightly soluble in alcohol, but it readily dissolves in carbon disulphide, chloroform and benzine. It undergoes alteration when exposed to the light. It is said to be well borne by the stomach, and to be comparatively non-toxic. Di-iodoform has been used with success by M. Maquenne in the treatment of ulcerated chancroids and wounds.

### IODOL.—Tetra-iodo-pyrol.

**Dose**, gr. $\frac{1}{4}$–v.

**Pharmacology and Physiological Action.**—By the action of iodine upon pyrol, a constituent of mineral oil, a chemical compound is formed containing about 90 per cent. of iodine; therefore a little less than iodoform, but having the important advantage of freedom from odor. Iodol occurs as a grayish-white powder, which darkens upon exposure to light; insoluble, or nearly so, in water; freely soluble in ether, chloroform, or alcohol, and in fatty oils. It is soluble in the gastric secretions, and, like iodoform, is decomposed in the organism. Iodol is rapidly absorbed and iodine soon appears in the saliva and urine. It is said not to produce stomatitis or nasal catarrh. Professor Pick found that when given in quantities as large as 30 to 45 grains a day it produced no further inconvenience than some headache and diarrhœa which, however, soon disappeared.

The effects of iodol are similar to those of iodoform, but it is said never to produce toxic action when used either as a topical application to wounds, or when administered internally in the ordinary medicinal doses. This statement, however, must be regarded as too positive. Dr. Marcus saw iodol cause death in animals from fatty degeneration of various organs, and a case has been reported by Lanenstein, in which the external application of iodol caused vertigo, vomiting, fever and albuminuria.

**Therapy.**—Iodol may be dusted over wounds in the form of an impalpable powder, or it may be used in ointment or solution. An ointment of iodol may be made of any desired strength, from 10 grains to the ounce upward, and constitutes an excellent antiseptic dressing to venereal and common ulcers, furuncles and carbuncles. A weak ointment containing this substance is beneficial in variola, in which it mitigates the active cutaneous inflammation. A stronger preparation may be employed in tinea tonsurans, and is capable of modifying the course of psoriasis. Iodol ointment is used with advantage upon the enlarged glands of scrofula, or upon the ulcers consequent to their caseous degeneration. Mazzoni prefers a solution in alcohol and glycerin (iodol 1, alcohol 16, glycerin 34 parts) as a topical application, and finds it of service in erysipelas, diphtheria, hydrocele and synovitis. Schmidt considers iodol superior to iodoform in the treatment of fistulæ. An ethereal solution (1 to 8) is used as that of iodoform is,—in ulcers of mucous membranes. Dr. Tarbau, of Davos, obtained good results in ozæna from the use of equal parts of iodol, tannic acid and borax as a snuff. Cervicitis, endometritis and metrorrhagia have been decidedly benefited by the local application of powdered iodol.

The topical application of iodol has been found of service by Professor Pick in vaginitis, whether of simple or gonorrhœal origin.

Administered by insufflation or inhalation, this remedy has afforded relief in tuberculosis of the larynx or lung, and in bronchorrhœa. The powder has been found of service in various diseases of the eye, and is of special value in catarrhal conjunctivitis. Iodol has also yielded good results in the management of primary or secondary ulcerations of the cornea, chronic affections of the lachrymal duct and suppurating dacrocystitis. It is of service, likewise, in otorrhœa associated with caries of bone. Iodol is also made into suppositories, soluble bougies, iodol cotton, iodol gauze, etc.

It may be administered internally in any form—since it has very little taste and yields iodine to the organism very readily—in the treatment of the tertiary stage of syphilis, in scrofula, phthisis, etc. In these affections from 5 to 20 grains have been given daily, and in the dose of 2 to 6 grains thrice daily Cerna has seen good results from the use of iodol in diabetes. Favorable results have been published by Pick, Cervesato, Martin, Lublinski, Seifert, Szadeck and other observers. Cervesato, in three cases, saw absorption of pleural exudations promoted by the internal administration of iodol. Good reports have been made of the use in cerebro-spinal meningitis of a combination of 5 grains of iodol and 2½ grains of acetanilid every third hour.

**Caffeine-iodol.**—This is a crystalline product obtained by mixing alcoholic solutions of caffeine and iodol in molecular proportion. It contains 74.6 per cent. of iodol and 25.4 per cent. of caffeine. The compound is of a light gray color, destitute of odor or taste, and is proposed as a substitute for iodol. Caffeine-iodol is a stable body and is nearly or quite insoluble in most menstrua.

**IODUM** (U. S. P.).—**Iodine.**
**Dose,** gr. ss–j.

*Preparations.*

*Amylum Iodatum.*—Iodized Starch (5-per-cent. iodine). *Dose,* gr. ii–ʒj.

*Liquor Iodi Compositus* (U. S. P.).—Compound Solution of Iodine, Lugol's Solution (iodine 5, potass. iod. 10, distilled water 85 parts). *Dose,* ♏v–xx.

*Tinctura Iodi* (U. S. P.).—Tincture of Iodine (iodine 7 per cent). *Dose,* ♏i–v.

*Unguentum Iodi* (U. S. P.).—Iodine Ointment (iodine 4, potass. iodid. 1, water 2, benzoinated lard 93 parts).

*Liquor Arseni et Hydrargyri Iodidi* (U. S. P.).—Solution of Arsenic and Mercuric Iodide (Donovan's solution, 1 per cent. each of arsenic iodide and mercuric iodide). *Dose,* ♏i–x.

*Pilulæ Ferri Iodidi* (U. S. P.).—Pills of Ferrous Iodide. *Dose,* 1 or 2 pills.

*Ferri Iodidum Saccharatum* (U. S. P.).—Saccharated Ferrous Iodide. *Dose,* gr. ii–x.

*Syrupus Ferri Iodidi* (U. S. P.).—Syrup of Ferrous Iodide. *Dose,* ♏v–xxx.

*Syrupus Acidi Hydriodici* (U. S. P.).—Syrup of Hydriodic Acid (1 per cent. of absolute acid). *Dose,* f ʒ ss–ij.

*Potassii Iodidum* (U. S. P.).—Potassium Iodide. *Dose,* gr. v–xxx.

*Unguentum Potassii Iodidi* (U. S. P.).—Ointment of Potassium Iodide (iodide, 12, sodium hyposulphite 1, boiling water 10, benzoinated lard 77 parts).

*Sodii Iodidum* (U. S. P.).—Sodium Iodide. *Dose,* gr. v–xxx.

*Ammonii Iodidum* (U. S. P.).—Ammonium Iodide. *Dose,* gr. v–xxx.

*Argenti Iodidum* (U. S. P.).—Silver Iodide. *Dose,* gr. i–ij.

*Arseni Iodidum* (U. S. P.).—Arsenic Iodide. *Dose,* gr. $\frac{1}{20}$.

*Sulphuris Iodidum* (U. S. P.).—Sulphur Iodide. *Dose,* gr. i–iv.

*Unguentum Sulphuris Iodidi.*—Ointment of Sulphur Iodide (gr. xxx to lard ℥j).

*Hydrargyri Iodidum Flavum* (U. S. P.).—Yellow Mercurous Oxide. *Dose,* gr. $\frac{1}{10}$–$\frac{1}{3}$.

*Hydrargyri Iodidum Rubrum* (U. S. P.).—Red Mercuric Iodide. *Dose,* gr. $\frac{1}{40}$–$\frac{1}{10}$.

*Plumbi Iodidum* (U. S. P.).—Lead Iodide. For external use.

*Zinci Iodidum* (U. S. P.).—Zinc Iodide. *Dose,* gr. i–iij.

*Iodi Trichloridum.*—Iodine Trichloride. For external use.

*Acidum Carbolicum Iodatum.*—Iodized Phenol (iodine 20, carbolic acid 76, glycerin 4 parts). For external use.

*Ethyli Iodidum.*—Ethyl Iodide (hydriodic ether). *Dose,* ♏x–xv. For inhalation.

**Pharmacology.**—Iodine is a bluish-gray, non-metallic element, obtained principally from the ashes of sea-weeds. It was discovered in 1811 by Courtois, and its properties investigated by Gay Lussac in 1813. Iodine melts and sublimes at about 225° F., but volatilizes at ordinary temperatures so that the upper part of the bottle containing it is usually filled with the characteristic violet vapor of iodine. It is very slightly soluble in water, requiring 7000 parts of water; on the contrary, alcohol and ether dissolve it freely, forming dark-brown solutions. The addition of water to the alcoholic solution precipitates part of the iodine, unless potassium iodide be added to the solution. The tincture of iodine may be decolorized by the addition of a small quantity of ammonia-water, followed by a few drops of carbolic acid, or by combination with sodium hyposulphite, making colorless tincture of iodine. The ammonia preparation should not be made in quantity or kept on hand, as it may deposit the iodide of nitrogen, which is a dangerous explosive compound. The combinations of iodine are numerous, and many of them are official. Ethyl iodide is not included in the pharmacopœia, but has some medical interest. It is prepared by the action of alcohol on iodine in presence of amorphous phosphorus. Phosphorus iodide is formed and reacts upon the alcohol, yielding ethyl iodide and an acid of phosphorus. The former distils into the receiver together with the alcohol, which escapes the reaction. Water is added and the lower layer of liquid is separated, dried with calcium chloride, and rectified in a water-bath. Ethyl iodide is a colorless liquid, but becomes brown when long kept, if exposed to light. Its characters have been already considered. The syrup of hydriodic acid contains 1 per cent. of absolute hydriodic acid, which is a gaseous body containing 99¼ per cent. of iodine by weight; it is readily decomposed, and is a valuable agent for the purpose of introducing iodine into the system in the least irritating form, though therapeutically active. The iodide of starch, amylum iodatum (not to be confounded with amyli iodidum, iodide of amyl), was formerly official as a means of administering iodine, but it has been given in quantities as high as an ounce at a time with little noticeable effect, and is seldom used at present. This may be explained by the fact that starch is the antidote to iodine, and is the chemical test for free iodine, by which it is turned from a white color to blue. Iodine trichloride occurs in yellow pieces, and is decomposed by water into hydrochloric and iodic acids. It is liquefied by the addition of iodine. Iodine trichloride is a stable compound if preserved from contact with organic matter. Iodine tribromide has also been utilized to a certain extent as a local application.

As the iodides are easily decomposed this fact must be borne in mind when prescribing them, and, as a rule, it is best to administer them simply dissolved in water or combined with other iodides. When potassium iodide is present in solution with corrosive sublimate the biniodide is formed, which is again dissolved in an excess of potassium iodide, forming potassium iodohydrargyrate. Alkalies, alkaloids and metallic salts generally are incompatible with iodine and its salts.

**Physiological Action.**—Iodine discolors the skin, turning it brown, and, if sufficiently concentrated, acts as an irritant, and may cause vesication or sloughing. After a coat of iodine there is some hyperæmia, and the sensory nerves are stimulated so that the effects of a counter-irritant are obtained; subsequently, the superficial epithelial layer becomes dry and peels off, leaving a reddened surface. Its vapor is rather irritating to the air-passages. Iodine is a valuable antiseptic, and, when inhaled into the bronchial tubes, or separated from the general circulation and deposited upon the surface of the bronchial mucous membrane, it exercises a beneficial influence upon the tissues and prevents decomposition of the secretions. In the stomach it is at first irritant, but rapidly forms combinations with organic or starchy compounds and passes into the blood, where it acts as an alterant, and especially counteracts the effects of the syphilitic virus and promotes the absorption and removal of its products from the body. To a less marked degree this remedy acts upon the tissues affected by tuberculosis, removing effete material and rendering them less favorable for the development of bacilli. The alkaline iodides are very soluble (potassium iodide dissolving in its own weight of water), and diffuse readily into the blood. They are excreted especially by the air-passages, and frequently set up a coryza and profuse mucous discharge from the bronchial mucous membrane, accompanied by swelling, congestion, or inflammation of the throat and conjunctivæ, with more or less irritation of the kidneys and skin.

The most common form of iodide eruption is that of papules, or wheals, which are darker than the surrounding skin and surrounded by a zone of inflammation (acneiform); but occasionally, from some peculiar susceptibility to the action of the drug, the degree of hyperæmia is so great as to lead to effusion beneath the epidermis, and vesicles are formed, filled with clear lymph, which afterward becomes white or milky. Sometimes the eruption is so universal that it resembles chicken-pox, purpura, or small-pox, but is unaccompanied by fever, or by more than a temporary elevation of temperature. An acute eczema, accompanied by constitutional disorder, has been observed as a result of the ingestion of this drug. Dr. R. W. Taylor has described a remarkable case of iodide eruption in which, after the administration of increasingly large doses of potassium iodide, a number of large tumors appeared upon the face.

Other symptoms, such as headache, unpleasant taste in the mouth, ptyalism, disordered digestion, malaise, and emaciation, appear after the system has become saturated with the drug, and these symptoms indicate the condition of **iodism**, which varies in degree from merely a few acneiform papules upon the forehead to a state of irritant poisoning. Œdema of the glottis is an occasional effect of the ingestion of potassium iodide. This manifestation, which takes place in the absence of any pathological condition of larynx or kidney, has been made the subject of a paper by Dr. Grœnouw. This writer refers the origin of the accident to idiosyncrasy, and remarks that it does not follow the repeated administration of large doses of the salt, but manifests itself after a few comparatively small doses have been taken.* Other unusual manifestations of iodine poisoning are occasionally witnessed. Gautier has reported a case in which the symptoms were thought to be due to prolonged inhalation of sea-air, and another in which iodism was caused by inunction with potassium iodide. Each of these cases was marked by emaciation and prostration. In the second case fixed delusions and melancholic mania were present. Severe neuralgia, especially of the trifacial, sometimes follows the administration even of small doses of potassium iodide. Pains in the extremities are also occasioned in some instances. Affections of the nerves of special sense may be caused by this drug; hyperæsthesia of the retina, photophobia, fixed contraction or dilatation of the pupil have been seen as the result of the ingestion of iodine. Dr. Ernest Finger points out that, as iodine has been experimentally shown to produce dilatation of the cerebral blood-vessels, with retardation of the circulation, it should be cautiously given whenever intracranial lesions exist. He has known paralysis and retinal hæmorrhage to be excited by its use.

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* Revue de Laryngologie, etc., September 15, 1890; *Medical Bulletin*, February, 1891.

In the absense of special idiosyncrasy, large doses are most productive of iodism in children and old people. Maniacal symptoms have supervened in consequence of massive doses.

The phenomena of iodism are particularly apt to occur in persons who suffer from renal disease.

Dr. W. L. Russel has reported a case of death from iodism. The administration of a few small doses of potassium iodide combined with syrup of ferrous iodide was followed by inflammation of the eyes, nose and throat together with a bullous eruption upon the skin. Death occurred on the tenth day after the first dose had been taken from a low grade of pneumonia and inanition.

The treatment of iodism is largely symptomatic, using starch if there is free iodine in the alimentary canal, deodorized tincture of opium, warm baths, and large draughts of water and demulcents.

Chemical considerations have suggested the theory that the phenomena of iodism are due to the liberation of iodine by nitrites present in the blood. This change can only take place in regions where the reaction is acid. Since sulphanilic acid destroys nitrous acid, it has been proposed that the former substance, together with sodium bicarbonate, should be used as an antidote. According to Röhmann and Malachowski, from 2 to 3 drachms of sodium bicarbonate, given in two doses within twenty-four hours, will cause the symptoms of chronic iodine poisoning to disappear. These writers likewise claim that when potassium iodide and sodium bicarbonate are administered in combination, the symptoms of iodism are prevented. The carbonate or the aromatic spirit of ammonium has been given with the iodide for the same purpose, but with doubtful results. A few drops of Fowler's solution, given in conjunction with the iodide, is, however, more effective, and will usually prevent the development of iodism. The association of a small dose of belladonna or an equal quantity of the potassium bromide with iodide is also recommended as a preventive of tonic manifestations from iodine. It should not be forgotten that even a small dose of iodine will, in some persons, produce marked physical and mental depression without the occurrence of coryza, sore throat, or disturbed stomach. An acute form of intoxication may also arise from the administration of iodine, the symptoms being those of acute gastro-enteritis, the treatment consisting of starch-water, evacuation of the stomach, external heat, and hypodermic injections of cardiac and respiratory stimulants. In a case of chronic poisoning, with alarming prostration, Whitla availed himself of the fact that elimination takes place largely by the salivary glands, and directed his patient to chew pellitory root, a powerful sialagogue. A remarkably profuse secretion of saliva containing the iodide was followed by rapid improvement.

Death has occasionally been caused by iodine, whether taken into the stomach or injected into the cavities of the body. The fatal event may be delayed for a number of days and may then take place suddenly from heart-failure. The vomiting excited by iodic intoxication is of a yellowish-brown color, or blue if starchy matter had been present in the stomach. Dr. W. O. Culpeper has recorded a case in which the application of the tincture of iodine externally caused extensive sloughing, symptoms of acute iodism and death on the sixth day. The patient was a child of eleven years. In some of the cases where iodine was absorbed from the cavities of the body the egesta contained the drug. Iodine, after absorption, enters into all the tissues and fluids of the body. It is chiefly eliminated by the kidneys, partly in the form of an alkaline iodide and partly in organic combination. According to Professor Sée it accumulates within the system when given continuously and can be detected in the saliva after it has disappeared from the urine. Iodine is probably excreted to some extent by all the mucous membranes.

The iodides remove certain metallic poisons from the system by combining with them to produce soluble salts; in such cases large doses of iodides might liberate so much of the metal from the tissues as to produce symptoms of metallic poisoning. This is exemplified by the fact that potassium iodide may occasion salivation in an individual who has been upon a mercurial course. If a considerable quantity of the metal have been stored up within the system, its solution and entrance into the circulation may be followed by ptyalism. On the other hand, when there has been less accumulation of the mercury, potassium iodide will rapidly remove it from the system. The iodide thus exerts an apparently paradoxical action, in that it sometimes relieves and at others augments mercurial ptyalism. In recent cases of mercurialism, however, the iodide will but add to the mischief.

Patients should be warned, on the appearance of such symptoms or on the occurrence of iodism, to at once discontinue the remedy. Some are unable to bear more than a few grains, and even so small a quantity as 5 grains may produce coryza, salivation, or a general vesicular eruption upon the skin; others can take as many drachms without the slightest inconvenience, and some dermatologists give from 12 to 16 drachms of potassium iodide a day for tertiary syphilis without producing iodism. Part of the good effects of codliver-oil in these disorders is ascribed to a small proportion of iodine which it contains.

In the normal condition the iodides and iodine have no effect upon temperature or blood-pressure, when administered by the ordinary channels. Introduced into the veins, they cause slight increase, soon followed by decrease, of pressure. According to Germain Sée, potassium iodide reduces the size of the heart.

Anaphrodisiac effects are observed after the long-continued use of potassium iodide, and the belief is generally entertained, though disputed by some, that such protracted use causes atrophy of the mammary glands and testicles. A full or somewhat excessive dose of iodine has been known to cause sexual excitement, and Professor Stillé states that it may give rise to profuse menstruation or occasion abortion during pregnancy.

Owing to its solubility, potassium iodide is rapidly absorbed and rapidly eliminated. Within fifteen minutes after its ingestion it is present in the saliva and urine. It is likewise removed by the skin, and in the milk of nursing women. Iodine has been found in the urine of a suckling babe, whose mother was taking potassium iodide. The urine is increased in quantity by potassium iodide, though we lack exact knowledge of the effect of the drug upon the urinary constituents. It often causes oxalates to appear.

In some instances its administration has been followed by albuminuria.

In a series of experiments upon himself, M. Georges Doux took 45 grains of potassium iodide twice daily for twenty consecutive days. After the second day the quantity of the salt present in the urine varied but little, and amounted to about 90 per cent. of the dose ingested. The normal proportion of urea was decreased by about one-fifth. Seventy-five hours after discontinuance of the drug no trace of it could be discovered in the urine. The experiments were twice repeated with the same results. The amount of iodide eliminated fell to 60 per cent. if a little absinthe had been taken on the preceding day.* Dr. Haig believes that the iodides diminish the excretion of uric acid and the urates.

The effect of small doses of potassium iodide upon nutrition has been studied by Volkoff and Stadnitzki, of St. Petersburg. These writers report that the assimilation of carbohydrates in the food is but slightly diminished, the nitrogenous exchange is increased, oxidation is diminished and the destruction of organic albumin is increased, judging by the augmented quantity of sulphur in the urine. The weight of the body is but slightly decreased and the assimilation of fat is diminished to a very slight extent.

**Therapy.**—Iodine in substance may be used as a disinfectant for drains, but it has no advantage over much less expensive agents which are better antiseptics. In the form of tincture it is very generally used as a counter-irritant and resolvent for various swellings, enlarged glands, buboes, swollen joints, abscesses, chilbains, and inflammation of the gums.

The dental tincture of iodine used by Flagg is as follows:—

R Tinct. iodi, . . . . . . . . . . . f ʒ iij.
Spiritus vini rectificati, . . . . . . . . . . f ℥ j.
M. Dissolve the iodine by succussion during several days.

The object attained, says Flagg, by this extraordinary tincture is the ability to make accurate spottings upon the inflamed gums, which shall maintain circumscribed and persistent absorbent or counter-irritant effect. The parasiticide effects are shown when this tincture is painted over a spot of tinea or ringworm, which may yield to this treatment. In chronic ringworm Dr. C. W. Cutler, of New York, uses with good results the following mixture:—

℞ Acidi carbolici,
Chloralis hydrat.,
Tr. iodi, . . . . . . . . . . āā ℥j.
M.

The local application of tincture of iodine is efficacious in tinea versicolor when the patches are not too large or numerous.

For toothache from exposed pulp, Garretson recommends the following:—

---

* *British Medical Journal*, September 27, 1890.

| | |
|---|---|
| ℞ Creosoti, | ♏vj. |
| Tinct. iodi, | fʒj. |
| Liq. plumbi subacetatis, | fʒj. |
| Chloroformi, | |
| Tinct. opii, | āā fʒss. |

M. Sig.: Apply on the softest cotton-wool, laid delicately upon the pulp. Brush the same on the surrounding gum.

The local application of the tincture of iodine has been recommended in order to arrest retraction of the gums in aged people.

The dental ointment of potassium iodide recommended by Flagg, consists of the following :—

| | |
|---|---|
| ℞ Potassii iodidi, | gr. xx. |
| Liquoris potassæ, | ♏ij vel iij. |
| Cerati simplicis, | ℥j. |

M. et ft. ungt.

This is a valuable ointment which will not discolor the skin, used in discussing indurations on or about the face and jaws.

A colorless iodine ointment may be prepared according to the following formula :—

| | |
|---|---|
| ℞ Iodi, | gr. xx. |
| Potass. iodid., | gr. iv. |
| Sodii sulphit., | gr. xl. |
| Aquæ, | q. s. |

Rub the ingredients with the water till the solution is colorless. Then add

| | |
|---|---|
| Adipis benzoat., | ℥j. |

M.

In pneumonia and pleurisy, especially of the chronic form, or fibroid phthisis, great benefit results from painting the affected side of the chest with iodine, giving several coats of the tincture with a camel's-hair brush, repeated each day until sufficient action is set up or the skin peels off. Part of the iodine is absorbed and exercises a local alterative effect.

In chronic bronchitis, also, the tincture of iodine is serviceably applied to the chest. The ointment, tincture, or liniment of iodine affords relief in intercostal neuralgia and rheumatism affecting the intercostal muscles. The conjoined internal and external use of iodine is of great value in bronchocele. In simple glandular hypertrophy the compound solution of iodine or potassium iodide, preferably the latter, is administered by the mouth ; while the tincture, liniment, or ointment is locally applied, care being taken to avoid vesication. The ointment of potassium iodide is sometimes employed for the same purpose or the formerly official ointment of the red mercuric iodide. The remarkably successful method practised by the East Indian army surgeons consisted in the application of the ointment of the red iodide, after which the patient was made to sit for some hours with his neck exposed to the rays of the sun or to a hot fire. Assuming that the action of the remedy was increased by the influence of heat Dr. Dawson Turner, of Edinburgh, suggests that the fact may be explained by the physical properties of iodine. A solution of iodine in carbon disulphide cuts off the visible rays of the sun, but transmits the invisible heat-rays. From this circumstance the deduction is drawn that diseased parts to which iodine has been applied should not be covered, but subjected to the action of the heat.

Another excellent method consists in the injection of tincture of iodine into the substance of the goitre. It is best to begin with no more than 5 drops, the operation being repeated weekly or semi-weekly and the quantity gradually increased to 10, 15, or 20 drops. In cystic or calcareous degeneration of the thyroid this plan of treatment is of no avail. Other hypertrophies are amenable to the same method, as, for instance, enlarged lymphatic glands prior to caseation and enlarged spleen. The cavities of abscesses and monocystic tumors are, after evacuation, advantageously flushed with water impregnated with a small quantity of tincture of iodine. Empyema has been treated in the same way after aspiration.

Since proposed, in 1848, by Dr. Brainard, the injection of iodine has been practised with varying and doubtful success in spina bifida. Cures have been reported, while, on the other hand, many failures, whether reported or not, have occurred. If this operation be undertaken the quantity injected should be small and the solution weak. No more serum should be withdrawn than the quantity of fluid about to be injected. Pepper and others have injected the tincture of iodine into pulmonary cavities with a view to disinfection, and, possibly, obliteration by healthy reparative inflammation. Though the plan seems rational it is not always feasible, is attended by some pain and reaction, and certainly has never been generally approved or adopted. The injection of iodine, as in the Shurley-Gibbes plan of treating tuberculosis, usually gives rise to considerable pain. In order to overcome this disadvantage Dr. A. O. Squier incorporates with the original mixture a small quantity of creosote or guaiacol and some iodoform. His formula is:—

| | |
|---|---|
| ℞ Eucalyptol., | ♏xxxij. |
| Guaiacol. pur., | ♏xvj. |
| Iodoform., | gr. viij. |
| Iodin., | gr. iv. |
| Ol. amygdal. dulc., | q. s. ad f℥j. |

M. Sig.: From 10 to 30 minims to be injected daily or alternating with gold and sodium solution as desired.

A solution of iodine has been employed by Professor Durante, of Rome, injected subcutaneously or into the substance of a muscle in cases of pulmonary and articular tuberculous disease. Dr. Mennella has made use of the same method in non-tuberculous affections of joints. Peri-articular injections of iodine caused rapid disappearance of the fluid in two cases of hydrarthrosis of the knee of traumatic origin. A similar procedure was efficacious in glandular enlargements, syphilis, grave malarial cachexia and other maladies.

The parenchymatous injection of a few drops of tincture of iodine causes resolution of enlarged tonsils. In performing this operation the close proximity of the carotid artery should be borne in mind. The ointment, applied directly to the tonsils by means of a camel's-hair brush, is said by Cerchiari to accomplish the same result. The application of the tincture diluted with seven or eight times its bulk of water will also generally produce the same effect.

The following prescription can sometimes be used with good effect in enlarged tonsils or in chronic pharyngitis:—

| | | |
|---|---|---|
| ℞ | Tinct. iodi, | f ʒ j. |
| | Glycerini, | |
| | Extracti ergotæ fl., | āā f ℥ j. |

M. Sig.: Apply once or twice a day with a camel's-hair brush.

Garretson employs in sore throat, especially that which occurs in clergymen and public speakers, the following combination of iodine:—

| | | |
|---|---|---|
| ℞ | Liq. iodi compositi, | f ʒ j ♏xx. |
| | Acidi carbolici, | ♏xij. |
| | Glycerini, | f ℥ ij. |
| | Aquæ, | f ℥ xiv. |

M. Sig.: To be used as a gargle from eight to a dozen times a day.

The tincture of iodine is often painted upon or around patches of erysipelas, and, although the application sometimes does good, it not infrequently aggravates the condition. It is judicious to dilute the preparation with an equal quantity of glycerin or alcohol, or combine the iodine as follows:—

| | | |
|---|---|---|
| ℞ | Tinct. iodi, | |
| | Acidi carbolici, | āā f ʒ ss. |
| | Glycerini, | f ℥ iv. |

M. Sig.: Apply with a camel's-hair brush several times a day for erysipelas.

In ringworm, iodine may be used in the form of colorless tincture, or in combination with the colorless oil of tar (1 in 4):—

| | | |
|---|---|---|
| ℞ | Potassii iodidi, | ʒ ij. |
| | Ol. menth. pip., | ♏xx. |
| | Lanolini, | ℥ j. |

M. Sig.: Embrocation for painful joints, neuralgia, chronic rheumatism, etc.

Ringworm may also be efficaciously treated by means of iodized collodion, 8 to 12 grains of metallic iodine being dissolved in alcohol and ether and added to an ounce of collodion. The mixture is painted upon the affected part for several successive days until a thick layer is formed. This layer is left undisturbed for a fortnight.

The tincture of iodine is one of the articles employed to prevent pitting in small-pox. The solution should be painted over the surface of each pustule. An ointment containing iodine is occasionally followed by good results in keloid and scleroderma. Alone or combined with an equal quantity of glycerin or carbolic acid, the tincture of iodine is sometimes beneficial when painted upon lupous areas. Lentigo and chloasma may be cured by the local application of tincture of iodine, and the same preparation added to salt water forms a beneficial wash in chronic ozæna. In orchitis, after active inflammation has subsided, the cautious local application of the tincture promotes absorption of the exudation material. The same treatment is of service after subsidence of inflammation of the mammary gland or ovary.

Boils and carbuncles may be checked by painting iodine freely upon a neighboring vascular area. Iodine may be used as a stimulant to old ulcers, especially in gynæcology, as iodized phenol; although iodoform, on account of its anæsthetic effects, has largely taken the place of iodine.

A saturated solution of tannic acid in tincture of iodine is also a useful topical application in chronic inflammation of the uterine canal. Dr. Routh states that the vomiting of pregnancy is arrested by brushing the cervix and lower part of the cervical canal with a mixture of equal parts of iodine, potassium iodide, alcohol and water. Professor Tarnier makes use of a mixture of tincture of iodine (f℥j) and potassium iodide (ʒiss) in distilled water, 1 quart, as an intra-uterine douche after labor. Dr. Chibret has proposed the application of tincture of iodine in certain forms of corneal ulceration, touching the affected surface once or twice daily with a small roll of cotton-wool moistened with the liquid. M. Sedan, who has made a trial of the local use of the tincture in the case of rebellious ulcers of the cornea, declares that the treatment is painful and unmanageable, and has a tendency to produce ciliary blepharitis.

Russian physicians have employed iodine with marked advantage in hæmorrhoids. Ivanoff describes a severe case, rebellious to ordinary methods, in which the daily application of the tincture for three days caused almost complete disappearance of the large tumors. Preissman extols, in the same condition, the application of a compress moistened in a glycerin solution of iodine and potassium iodide. The iodide of starch is valued by Mr. Marshall as a dressing to syphilitic ulcers. Hydrocele is cured by evacuation of the contents of the sac and injecting 15 to 20 mimims of tincture of iodine into the cavity, as practised by Professor Pancoast. Severe inflammation results and the sac becomes obliterated. Iodized wool is useful for making extemporized pessaries. I. Rosenberg has found a 20-per-cent. solution of potassium iodide, painted upon the tongue, efficacious in the treatment of leukoplakia.

Internally, tincture of iodine and camphor may be inhaled for acute coryza and hay asthma.* Inhalation of the vapor of iodine is very beneficial in chronic bronchitis with bronchiectasis, or profuse and fetid muco-purulent expectoration.

The inhalation of iodine and turpentine is recommended in laryngeal and pulmonary tuberculosis by Dr. Jolly and others, who claim that it is an excellent adjuvant to the other methods by which it is sought to relieve the disease. This formula may be quoted:—

| | |
|---|---|
| ℞ Pulv. iodi, | 10 parts. |
| Alcohol, | 20 " |
| Mix in a flask and add— | |
| Ess. terebinthin., | 20 " |
| Sp. lavandulæ, | 10 " |
| M. | |

When the mixture is shaken the free iodine is lost and exists in the form of a terebinthinate compound. It has no irritant effect upon the mucous membranes.

Bartholow speaks favorably of the internal use of ammonium iodide in acute catarrh, a grain being given every second hour. Hay asthma is ameliorated by larger doses of the same remedy, which is useful, moreover, in capillary bronchitis and bronchorrhœa. An acute coryza may not infrequently be aborted by 10 grains of potassium iodide taken at bed-time. Ammonium iodide is also recommended for the same purpose. Potassium iodide in 10-grain doses repeated several times a day is said to relieve paroxysmal sneezing.

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* *Therapeutic Gazette*, October 15, 1890, p. 678.

Ethyl iodide is administered by inhalation (♏x–xxx) whenever necessary to relieve coughing, especially in bronchitis, asthma, and phthisis, and is the most direct method of introducing iodine into the blood. In phthisis, good results have been reported from inhalation, by means of an atomizer, of a fine spray containing 1 part each of potassium iodide and corrosive chloride of mercury in 1000 of water, the solution being made stronger or weaker, according to the effects upon the patient. From its stimulating effects upon the kidneys potassium iodide is occasionally used to heighten the effect of other diuretics. The œdema of Bright's disease is, in some instances, markedly decreased by this remedy, though it has little power to check the escape of albumin. Potassium iodide, from its special determination to the mucous membrane of the air-passages, is frequently combined with expectorants and cough-mixtures in order to render the secretions more fluid. Its stimulating action upon the absorbents renders iodine useful, both internally and by topical application, in cases of inflammatory exudation or chronic enlargements. Where these are of syphilitic character the iodides are pre-eminently serviceable. For many brain diseases, more especially those occurring during tertiary syphilis, where gummata form or meningitis with exudation occurs, causing great pain, potassium iodide in combination with bromide, is more efficient than any other agent known; here the iodide must be given in ½-drachm or drachm doses, and pushed in order to get its full effect. If given well diluted with water, when the stomach is empty, no serious danger exists of producing iodism. In aortic aneurism, potassium iodide, in doses of 20 to 30 grains four times a day, with low diet and rest in bed, favors deposit of fibrin and obliteration of the tumor; the treatment must extend over months or for a year or more. Many of these cases may be occasioned by syphilitic disease of the aorta, and in this way the iodide is doubly serviceable. In the primary and secondary forms of syphilis, iodine compounds are of little use, but in the later changes of the skin, mucous membranes, and deeper structures they act promptly, and we may prescribe them with confidence.

In some of the late varieties of syphilis* the author can recommend the following formulæ containing the iodides:—

| | |
|---|---|
| ℞ Potassii iodidi, | ʒ v. |
| Tinct. cimicifugæ, | f ʒ ij. |
| Syr. sarsaparillæ comp., | f ℥ v. |

M. Sig.: Two teaspoonfuls in water three or four times a day.

| | |
|---|---|
| ℞ Sodii iodidi, | ʒ iiss. |
| Vini cocæ, | f ℥ x. |

M. Sig.: A tablespoonful three or four times a day.

| | |
|---|---|
| ℞ Ammonii iodidi, | ʒ v. |
| Tinct. nucis vomicæ, | f ʒ j. |
| Ext. rhamnus pursh. fl., | f ℥ j. |
| Glycerini, | f ℥ iv. |

M. Sig.: Two teaspoonfuls in water three or four times a day.

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* For the general medicinal treatment of late syphilis see author's "Practical Treatise on Diseases of the Skin," pages 178 and 179. D. Appleton & Co., New York, 1888.

According to the investigations of Leone Levi, potassium iodide, administered to syphilitic subjects, improves the quality of the blood, increases weight and strength, but decreases the quantity of urea excreted. Pellizzari concludes that this salt has a chemical action upon the products of tertiary syphilis and neutralizes the toxic material as it is formed.

An efficient combination for use in tertiary syphilis is:—

| | |
|---|---|
| ℞ Hydrarg. iodid. rubri, | gr. iij. |
| Potassii iodid., | ℥j. |
| Tr. iodin., | fʒj. |
| Syr. ferri iodid., | f℥j. |
| Aquæ, | f℥iij. |

M. Sig.: A teaspoonful in water after each meal.

A combination of iodides is sometimes more efficient in late syphilis.

In the treatment of gonorrhœal rheumatism, Schüller, of Berlin, gives potassium iodide (gr. v–vij) every two hours for two or three days. He considers it especially beneficial in the acute form. For local treatment he uses, in acute cases, compresses wet with carbolic-acid solution (1 to 100), and in chronic cases mercurial ointment. Aspiration of the joint is done where there is abundant effusion, and this procedure aids the action of the remedy. In chronic gout and in gouty affections, potassium iodide affords great relief, as it will also in chronic rheumatism. Considerable improvement sometimes follows the use of potassium or ferrous iodide in rheumatoid arthritis. Acute rheumatism is often relieved by large doses of potassium iodide, or the latter in combination with sodium salicylate or salicin:—

| | | |
|---|---|---|
| ℞ Potassii iodidi, | | |
| Sodii salicylatis, | āā | ʒiiiss. |
| Spiritus ætheris nitrosi, | | fʒij. |
| Syrupi aurantii, | | f℥iij. |

M. Sig.: Two teaspoonfuls in water every two or three hours.

| | | |
|---|---|---|
| ℞ Potassii iodidi, | | |
| Salicin., | āā | gr. c. |

M. et ft. capsulæ no. xx.
Sig.: Two or three capsules every two or three hours.

In acute rheumatism or gout, when attended with constipation, the following prescription, containing potassium iodide, is serviceable:—

| | | |
|---|---|---|
| ℞ Potassii iodidi, | | |
| Potassii acetatis, | āā | ʒiiiss. |
| Extracti rhamnus pursh. fl., | | |
| Glycerini, | āā | ℥j. |
| Aquæ cinnamomi, | | f℥iij. |

M. Sig.: Two teaspoonfuls in water every two or three hours.

Potassium iodide is the most efficacious remedy in the treatment of actinomycosis. In a case reported by Buzzi and Valeirio the fistulæ began to close, the swelling and pain to disappear in a few days, and recovery was complete in three months. In the treatment of psoriasis* large doses of one of the iodides, and preferably potassium iodide, is at times attended with complete removal of the eruption. Psoriasis is, however, more frequently controlled or cured by potassium iodide when the disease is depending upon rheumatism or gout. In periostitis, resulting from exposure to cold or wet, the iodides are rapidly curative, and the tincture may also be applied locally. In chronic mercury or lead poisoning the metal may be removed from the system by iodides, but the dose should be small and the treatment continued for some time. Chronic bronchitis with thick, tenacious sputa and asthma are very much helped by the administration of the iodides. Catarrhal pneumonia, acute or chronic, is benefited by doses large enough to liquefy the sputa (5 to 20 grains):—

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* See paper by the author on "The Cause and Treatment of Psoriasis," Transactions of the Pennsylvania State Medical Society, 1888.

| | |
|---|---|
| ℞ Potassii iodidi, | ʒ iiiss. |
| Tinct. lobeliæ, | f℥ iv. |
| Spiritus ætheris comp., | f℥ ij. |
| Syrup. aurantii, | f℥ iiss. |

M. Sig.: From one to two teaspoonfuls in water every two or three hours until relieved. Serviceable in chronic bronchitis and in asthma.

In the broncho-pneumonia of measles Dr. Bicente relies upon potassium iodide, which seldom fails to produce amendment within a few days provided tuberculosis be not present. Dr. Valten asserts that the administration of a large dose of potassium iodide—not less than 90 grains—given singly or in divided portions within twelve or, at most, twenty-four hours after the initial chill will bring about a rapid lysis or crisis of the fever in croupous pneumonia. This method does not abridge the course of the disease but, it is claimed, obviates the danger of cardiac collapse. After the first twenty-four hours no benfit is derived from the use of the remedy. The writer furthermore states that excellent results are obtained in epidemic cerebro-spinal meningitis from the administration of potassium iodide in doses of 45 to 90 grains, given once or several times during the day. It is said to act almost as a specific.

In cardiac dropsy sodium iodide alone or combined with digitalis and buchu is often most beneficial in its effect. It can be prescribed thus:—

| | | |
|---|---|---|
| ℞ Sodii iodidi, | | ʒ iv. |
| Infus. digitalis, | | |
| Infus. buchu, | āā | f℥ iij. |

M. Sig.: Two teaspoonfuls every three or four hours.

In Bright's disease Semmola prescribes:—

| | |
|---|---|
| ℞ Potass. iodid., | gr. xv. |
| Sodii phosphatis, | gr. xxx. |
| Sodii chloridi, | ʒ iss. |
| Aquæ, | ℥ xx. |

M. ft. sol. Sig.: The entire quantity to be taken during the day.

Potassium iodide is likewise of value in pulmonary emphysema and in asthma, especially in that form associated with chronic bronchitis and emphysema. In asthma dependent upon gastric conditions it is of little or no avail.

In chronic bronchitis and pleurisy the following combinations are useful:—

| | | |
|---|---|---|
| ℞ Potassii iodidi, | | ʒiv. |
| Syr. ferri iodidi, | | |
| Glycerini, | āā | f℥iss. |

M. Sig.: A teaspoonful in water four times a day.

| | | |
|---|---|---|
| ℞ Potassii iodidi, | | gr. xxiv. |
| Potassii bromidi, | | ʒj. |
| Ammonii chloridi, | | ʒij. |
| Syr. eriodictyi, | | |
| Aquæ, | āā | f℥iss. |

M. Sig.: A dessertspoonful every two or four hours, for cough with scanty expectoration.

Potassium iodide may be combined with potassium bromide for the treatment of epilepsy, as in Brown-Séquard's formula.

Dr. Lauder Brunton states that potassium iodide is the most efficient remedy in preventing the recurrence of attacks of angina pectoris. For this purpose he prescribes it in doses of 5 to 30 grains three times a day. Dr. Schweighofer has reported* a case of cretinism, associated with myxœdema and goitre, in which decided amendment followed the use of 15 to 30 grains of the same remedy continued for nine months. The myxœdema and goitre were favorably influenced and the patient gained in intelligence.

Dr. Schleich, from his observation of ninety-two cases of deep wounds, believes that the administration of potassium iodide, in doses of 5 grains three times a day, promotes repair.

The tincture of iodine has been administered internally in 5- to 8-drop doses in the treatment of malarial affections; and the compound solution (Lugol's solution) is widely known as a remedy in scrofulous affections of the skin and of the lymphatic glands, especially in syphilitic children. The solution, with arsenic, is very serviceable in some old syphilitic skin diseases attended by thickening and scaling.

Rothe advises the use in whooping-cough of a combination of iodine and carbolic acid.

De Renzi has observed a favorable influence upon the progress of pulmonary tuberculosis produced by the administration of a mixture containing iodine, potassium iodide and sodium chloride.

Zinc iodide is in white, needle-shaped crystals, and is unstable. It is best administered as a syrup (ʒi–℥j); dose, ♏xx–xl. It has been used in ointment, with lard (10 per cent.), in the treatment of tumors, and a solution (gr. i–ij to f℥j) has been injected in gonorrhœa. Stronger solutions have been applied to enlarged tonsils.

Small and repeated doses of ammonium iodide are efficacous in catarrhal jaundice. This salt may be serviceably employed in bronchitis and broncho-pneumonia. It is also considered of advantage in the early stage of cirrhosis of the liver and in chronic malaria, associated in the latter condition with arsenic.

Drop doses of the tincture of iodine will sometimes allay the vomiting of pregnancy. In the form of tincture, compound solution, or potassium iodide, this agent has been employed in typhoid fever, and, though no marked influence is exerted upon the course of the disease, the temperature, or the diarrhœa, Liebermeister believes that it effects a notable reduction of the mortality. Bartholow's combination of the tincture of iodine and carbolic acid seems to moderate the severity of typhoid fever:—

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* *Lancet*, December 16, 1893.

℞ Tinct. iodi, . . . . . . . . . . . fʒij.
  Acidi carbolici, . . . . . . . . . . fʒj.
M. Sig.: One to three drops thrice daily.

Dr. Phillips has given with success the tincture of iodine in doses of a few drops in cases of atonic diarrhœa. This writer states, moreover, that the preparation, used in the same manner, will often cure the tormina and tenesmus of dysenteric diarrhœa.

Iodine has been made use of in exophthalmic goitre, but with doubtful results. Lentovsky has recently reported the cure of a typical case by the internal use of potassium iodide conjoined with the application of an iodine ointment. The goitre and exophthalmos had disappeared, the heart's action had become regular and, after an interval of four years, no relapse had occurred.

Ringer states that "in some epidemics of diphtheria" the inhalation of the vapor of iodine proves of signal service, and Dr. S. N. Zènenko[*] has lately spoken very highly of the internal administration of potassium iodide in that affection. From ½ to 3 grains were given to children, 5 to 8 grains to adults, and repeated every second, third, or fourth hour. Antiseptic gargles, alcoholic stimulation, and inunction of the enlarged cervical glands with mercurial ointment were used in conjunction. Of a series of twenty-one patients so treated none died, while of nineteen cases treated during the same time, in the same hospital (at Nijni Novgorod), after ordinary plans, 84 per cent. ended in death. The internal administration of potassium iodide will sometimes reduce enlargement of the mammary gland or testicle, and by some physicians is said to check the secretion of milk. Sciatica and lumbago are sometimes relieved by the same remedy. It is useful in the first stage of hepatic cirrhosis, in hypertrophic metritis, and in various syphilitic manifestations, especially when other remedies are not well borne by the stomach. Uterine fibro-myomata have been materially decreased in size by the use of this remedy either given by the mouth or injected into the substance of the growth. Chronic urticaria has been successfully treated with potassium iodide. Stern reported[†] five cases treated in this way. None were syphilitic, and all were rapidly cured. The itching was promptly relieved, and one patient became well after only 2½ drachms had been administered, although he had suffered previously for four months.

Baczkiewicz states that potassium iodide is readily absorbed by the rectal mucous membrane, iodine being detected in the saliva in five to fifteen minutes after administration by enema or suppository. According to the numerous experiments of Calantoni on men and animals, potassium iodide is absorbed as rapidly by the bowel as by the stomach; if speedy absorption is particularly desirable it may be obtained by heating the solution to 98° F. Elimination after injection into the rectum is as rapid as when it is taken by the mouth.

Kobner administers a potassium iodide combination by means of enema. Given once a day at first, but subsequently twice daily, the therapeutic action is said to be very rapid. He combines mercurial inunctions, and believes that this method is equally efficacious and better tolerated than subcutaneous injections. His formula is as follows:—

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[*] Vratch, No. 42, 1890; Satellite, January, 1891.

[†] *London Medical Recorder*, November 20, 1890.

| | |
|---|---|
| ℞ Potassii iodidi, | gr. xlv. |
| Potassii bromidi, | gr. xv. |
| Extract. belladonnæ folior. alc.. | gr. v. |
| Aquæ, | f℥vij.—M. |

Six drachms of this solution are added to 2 or 3 ounces of water and thrown into the rectum. Kobner frequently adds from 5 to 10 drops of pure tincture of iodine to each enema, and finds the mixture well tolerated by the large intestine. He has never observed any resulting local inflammation.

The potassium iodide and chlorate are incompatible, a deleterious salt, potassium-iodate, being formed.

Hydriodic-acid syrup is a very pleasant and certainly an efficient way of giving iodine in chronic broncho-pulmonary affections. It should not be used if discolored; one of the best preparations is that made by R. W. Gardiner, of New York, of unchangeable syrup of hydriodic acid. It renders excellent service in asthma, chronic induration of the lungs after pneumonia, pleuritic exudations, and in some skin diseases.

Dr. James Craig, of Jersey City, speaks very highly of the syrup of hydriodic acid in acute rheumatism. He gives from 2 to 3 drachms in a wineglassful of water every two or three hours until relief is experienced, afterward reducing the dose and continuing the remedy for several days if required. The pain and fever are reduced within forty-eight hours, and he believes that this treatment exerts an important influence in preventing cardiac complications. Its power over serious exudation and fibrous adhesive inflammation is well illustrated in pleurisy with large effusion, or in plastic pleurisy with adhesions. As the latter is a prominent predisposing cause of phthisis, it is important that it should receive attention early and be overcome by the administration of iodine, especially in the form of syrup of hydriodic acid. Wile has used this preparation with success in various forms of lead poisoning.

Iodized starch has lately been employed with asserted benefit by a number of Russian physicians as an intestinal disinfectant in typhoid fever and various septic affections of the bowels. It was given in the dose of 8 or 10 grains. Iodine trichloride, obtained by passing chlorine gas over iodine, occurs in the form of reddish crystals, is soluble in its own weight of water and freely soluble in alcohol. Either its aqueous or alcoholic solution can be mixed with glycerin without decomposition.

Iodine trichloride has been employed by Belfield, of Chicago, in genito-urinary and surgical affections. He finds it of advantage in tuberculosis and suppuration. For installation in the posterior urethra, for irrigation of the bladder and for hypodermic injections he made use of a one-tenth to one-half per cent. solution, either in distilled water, or in 4 parts of water with 1 part of glycerin. Serous cavities were injected with the same solutions. For cleansing suppurating wounds 1- to 5-per-cent. solutions were employed. To ulcerated carcinoma and venereal sores he applied a 5- to 20-per-cent. solution in equal parts of water, glycerin and alcohol. Dr. Pflueger, of Berne, recommends iodine trichloride in various affections of the eye. For subconjunctival injections a 1 to 1500 solution was employed. As a collyrium solutions from 0.1 to 1 per cent. were used. Gottschalk treated three cases of puerperal septicæmia, of which two recovered, by means of hypodermic injections of a 1-per-cent. solution, from 15 to 30 minims being injected once or twice a day.

Iodine tribromide has been used by Kraus for gargles and inhalations in diphtheria. His solution contained 20 drops to 18 ounces of water.

**Nosophen.**—This compound, obtained by the action of iodine upon a solution of phenolphthalein, is a light-yellow powder free from odor or taste, and contains 60 per cent. of iodine. It is insoluble in water and combines with metals to form salts. Nosophen has been used in rhinitis, after operations upon the nasal cavity and in venereal affections.

**ICHTHYOL.—Icthyosulphate of Ammonium or Sodium.**

**Pharmacology.**—A peculiar mineral deposit found in the Tyrol, of a bituminous character, yields, upon distillation, a tarry-looking substance called ichthyol, so named from the fact that the deposit appears to be the fossil remains of fishes. It is purified by distillation and with sulphuric acid. Ichthyol has a decided odor, which to some is very unpleasant. The odor may be disguised by the addition of 10 per cent. of the oil of citronella or by a mixture with coumarin. (Coumarin is an odorous principle contained in the tonka bean and other fragrant plants). It is faintly alkaline, and contains 10 per cent. of sulphur in the form of a sulphur acid. It is soluble in a mixture of alcohol and ether, readily mixes with ointment and fats. It is generally used in a 10-to 20-per-cent. ointment.

**Physiological Action and Therapy.**—Ichthyol applied externally, as well as when administered, has similar action, in many respects, to sulphur and tar. The resin contained in ichthyol makes it exceedingly objectionable for external application on account of the sticky or gummy deposit left upon the skin. According to the experience of the author, ichthyol is irritating to the integument of many, and is poorly absorbed in the majority of cases. Ichthyol given internally has, in some instances in the writer's experience, occasioned more or less gastro-intestinal irritation, folowed by diarrhœa. Dr. A. Stacquart, of Brussels, has reported several cases of gastro-intestinal difficulties attended by various nervous manifestations in which he found the internal administration of ichthyol very useful. He gave the drug in the daily dose of $\frac{1}{12}$ grain. It is said to check the elimination of albumin in Bright's disease and to be useful in pyelonephritis.

The free application of a 20-per-cent. ointment caused narcotism and stupor in a child, followed, however, by recovery. In the case of a woman whose endometrium had been curetted on the preceding day, Bergerio saw a rapid pulse and general depression, which continued for about twelve hours, follow the injection into the uterine cavity of a solution containing one-third of ammonium ichthyol to two-thirds of glycerin.

Unna considers ichthyol the best agent for treating certain chronic skin diseases, especially eczema and psoriasis. A 20-per-cent. ointment is sometimes useful in acute erysipelas, and also for the pain and swelling of the joints accompanying acute rheumatism. Ichthyol has been applied to burns, exudative erythema, intertrigo, herpes zoster, gout and neuralgia. It is said to relieve the pain and promote the healing of cracked nipples.

Dr. Ramon Guitéras, of New York, states that a 50-per-cent. ointment has given him better results than any other counter-irritant in gonorrhœal rheumatism. Ichthyol ointment has been employed in chronic eczema, acne, urticaria, lupus, and keloid. Dr. Agnew indorses its value in enlargement of lymphatic glands, and it acts well at times as an application in chilblains and burns.

Ichthyol has been extensively used in gynæcological practice. It has been found of service in cervical and corporeal endometritis, perimetritis and parametritis. It promotes the rapid absorption of recent exudates. Dr. Richard Bloch esteems it particularly valuable in the treatment of painful inflammatory diseases. Ichthyol exerts a good effect upon acute gonorrhœal and non-specific vaginitis, in which it manifests also a decided astringent influence upon the vessels. Jadasson applied with advantage a 10-per-cent. ointment of ichthyol in gonorrhœal catarrh of the cervix. The injection of a 2 to 5-per-cent. aqueous solution is beneficial in gonorrhœa of the male, diminishing the discharge, relieving the pain and preventing the chordee. A $\frac{1}{2}$ to 1-per-cent. solution may be employed to wash out the bladder in cases of cystitis. Dr. Scharff alleviated the pain and reduced the swelling of inflammation of the prostate by injection of a 10-per-cent. watery solution into the rectum.

Unna advises the combined external and internal employment of ichthyol in leprosy, and several cases have been reported in which this method was of considerable apparent benefit. The remedy has been used in small-pox in order to prevent pitting. Dr. Lorenz has found an ointment containing 1 to 10 per cent. of ichthyol serviceable in acute coryza and inflammation of all kinds involving the mucous membrane and skin of the nose.

In other conditions, accompanied by pain, as in acute sprains, the results of its use are sometimes satisfactory when applied with friction or massage. In uterine cancer, a 25-per-cent. ointment is said to relieve the pain and modify the course of the disease.

**Thiolinic Acid.**—This substance is prepared from a sulphurated linseed-oil by treating with sulphuric acid, and occurs as a thick, dark-green, viscid mass, which is insoluble in water and soluble in alcohol. It contains 14.2 per cent. of sulphur, principally in organic combination. Thiolinic acid combines with alkaline bases and its salts are soluble in water. The acid has a faint odor which resembles that of oil of mustard. The salts are without odor. It is thought that thiolinic acid will prove to be an efficient substitute for ichthyol.

## IODANTIFEBRIN.

**Dose**, gr. ii–viij.

**Pharmacology.**—This substance results from the interaction of iodine chloride and acetanilid. It crystallizes in rhombic tablets, which are slightly soluble in cold water, alcohol, and ether; more freely soluble in hot alcohol and glacial acetic acid; is without odor or taste, and appears to pass through the organism unchanged.

## IODANTIPYRIN.

**Dose**, gr. ss–ij.

**Pharmacology.**—This combination is prepared by a similar process to that which produces Iodantifebrin. Iodantipyrin crystallizes in colorless, lustrous, and prismatic needles, is without taste or special odor, is scarcely soluble in cold water or alcohol, but dissolves when these menstrua are warmed.

**Physiological Action and Therapy.**—Clinical experiments with both these bodies were carried on in the clinic of Professor von Jaksch, and the results have been published by Dr. Munzer. The antipyretic effects of iodantipyrin are identical with those of antipyrin and, in all probability, it is decomposed in the stomach into antipyrin and iodine. The reduction of temperature was accompanied by sweating, but was unattended by collapse or chills. An obstinate case of headache, apparently due to syphilis, was rapidly relieved by this substance, and in one case of acute rheumatism the pain disappeared within six hours after administration of the first dose.

## IODOPHENIN.

**Dose**, gr. ss–ij.

**Pharmacology and Physiological Action.**—Iodophenin, an iodine derivative of phenacetin, is a chocolate-brown powder, which, upon recrystallization from glacial acetic acid, yields crystals of a steel-blue color. It is soluble in alcohol, ether, and chloroform, almost insoluble in water, but releases a large proportion of iodine when brought into contact with water. It is said to be very destructive to the staphylococcus aureus, but, according to Dr. W. Siebel, its physiological action depends upon the iodine which it liberates. It discolors, and, if left long in contact with the skin, produces irritation. Iodine poisoning is liable to result even from small doses of the compound, when given by the mouth.

## IPECACUANHA (U. S. P.).—Ipecacuanha, Ipecac.

**Dose**, gr. ss–j to xx, as an emetic.

### *Preparations.*

*Extractum Ipecacuanhæ Fluidum* (U. S. P.).—Fluid Extract of Ipecac. *Dose*, ♏i–xxx.

*Syrupus Ipecacuanhæ* (U. S. P.).—Syrup of Ipecac, *Dose*, fʒi–ij.

*Vinum Ipecacuanhæ* (U. S. P.).—Wine of Ipecac. *Dose*, ♏x–fʒj.

*Trochisci Ipecacuanhæ* (U. S. P.).—Troches of Ipecac. *Dose*, one or more.

*Trochisci Morphinæ et Ipecacuanhæ* (U. S. P.).—Troches of Morphine and of Ipecac. *Dose*, one or more.

*Pulvis Ipecacuanhæ et Opii* (U. S. P.).—Powder of Ipecac and Opium (Dover's

Powder), (1 part each of opium and ipecac and 8 parts of sugar of milk). *Dose*, gr. ii–x.

*Tinctura Ipecacuanhæ et Opii* (U. S. P.).—Tincture of Ipecac and Opium (deodorized tincture of opium 100, fluid extract ipecac 10, diluted alcohol q. s. to make 100 parts). *Dose*, ♏i–xv.

*Emetina.*—Emetine, or Emetia. *Dose*, gr. $\frac{1}{120}$–$\frac{1}{4}$.

**Pharmacology.**—The Cephaëlis ipecacuanha of A. Richard (Rubiaceæ) is a small shrub of Brazil. The official portion is the root, which contains **Emetine,** an alkaloid, and **Ipecacuanhic acid,** a glucoside, with a trace of volatile oil, tannin, starch, gum, etc. The recent experiments of Dr. B. H. Paul and A. J. Cownley[*] seem to show that emetine is not homogeneous but is a mixture of two or more different substances. They state that the alkaloid existing in this drug is for the most part a perfectly amorphous substance, of marked alkalinity, forming definite neutral salts which are also amorphous. The amorphous alkaloid is associated with others which are distinctly crystalline and very different in physical characters. Emetine is but slightly soluble in water, it dissolves readily in ether, alcohol and chloroform.

The powdered root has a slight but characteristic and nauseous taste.

**Physiological Action.**—The prolonged application of ipecac to the skin causes irritation, followed by vesicles, pustules, or even ulceration. Inhalation of the powdered root irritates the air-passages and occasions coryza, or, in some persons, an asthmatic attack. Taken into the mouth, it increases the salivary secretion and excites nausea; and, in the stomach, in a similar way, small doses (gr. $\frac{1}{4}$) promote secretion, while large ones cause nausea and vomiting. Ipecac is a systemic emetic and causes vomiting when swallowed, and also when injected hypodermically in the form of fluid extract or the alkaloid, **Emetine.** This drug has a peculiar effect upon the pulmonary circulation, sometimes causing hyperæmia and at others reducing the amount of blood in the lungs and producing relative anæmia. Small doses stimulate the liver, and larger ones, after tolerance has been established, act as cholagogue cathartics. The active principle is excreted by the liver and gastro-intestinal tract. The skin is relaxed and perspiration increased; the secretions of the broncho-pulmonary mucous membrane are also increased. No marked effect upon the circulation is noticed, but emetine exercises a solvent action upon the red corpuscles when injected into a vein. The pulse is reduced in tension as a result of the act of vomiting, which also favors diaphoresis. Urticaria is occasionally caused by the internal use of ipecacuanha.

**Therapy.**—Ipecacuanha has been used externally with benefit in insect-bites. Neal[†] recommends the following, especially in mosquito-bites:—

℞ Pulv. ipecacuanhæ, . . . . . . . ʒss.
Spirit vini rectificati,
Ætheris, . . . . . . . . . āā ℥ss.—M.

In the dermatitis caused by rhus toxicodendron the free application of a wash containing powdered ipecacuanha in the proportion of

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[*] *Pharmaceutical Journal and Transactions*, July 26, 1893.

[†] *New York Medical Times*, January, 1891.

3 drachms to a pint of water is warmly recommended by Dr. W. S. Gilmore. In the form of a spray with a hand-atomizer a dilute solution of the wine of ipecacuanha, as recommended by Murrell and Ringer, is of great service in emphysema, fibroid phthisis, chronic bronchitis, and winter cough, in allaying the spasmodic vomiting and liquefying the secretions. Ringer dilutes the wine with 1 or 2 parts of water, and, using an ordinary hand-atomizer, twenty or more squeezes of the bulb are made, and the spray deeply inhaled, once daily at first, afterward more frequently. The mouth should be well rinsed out afterward and a piece of lemon-peel chewed to avoid a nauseating effect. When fractional doses of wine of ipecac are administered (♏j every hour or half-hour) they may act as a stimulant and overcome obstinate vomiting and retching, just as small doses of brandy do. In the vomiting of pregnancy it is said that a single drop taken every hour is curative; it certainly makes a decided mental impression, and also may overcome the morbid action of the stomach by substitution. Bartholow, however, declares that it has always failed in his hands, and that the statement is apocryphal. In hæmoptysis, small doses of the following combination have sometimes proved of service:—

| | |
|---|---|
| ℞ Pulveris ipecacuanhæ, | gr. xij. |
| Bismuth. subnit., | gr. xxiv. |
| Creosoti, | ♏vj. |

M. et ft. chartæ no. xij.
Sig.: A powder every hour or two until relieved of nausea or vomiting.

In hæmoptysis, small doses of the powder, short of producing vomiting, serve to reduce the bleeding by decreasing the pulmonary congestion. It has also given good results in the treatment of epistaxis and uterine hæmorrhages.

When, in bronchitis, the secretions are viscid and the cough hard, ipecac in combination with other expectorants is generally resorted to. The appended formula containing ipecacuanha are to be recommended in bronchitis:—

| | |
|---|---|
| ℞ Vini ipecacuanhæ, | fʒij. |
| Syrup. scillæ, | fʒij. |
| Tinct. opii camph., | fʒss. |
| Glycerini, | q. s. ad fʒv. |

M. Sig.: One or two teaspoonfuls whenever necessary for the relief of cough.

| | |
|---|---|
| ℞ Syrup. ipecacuanhæ, | f℥ss. |
| Ammonii chloridi, | ʒij. |
| Spiritus ætheris nitrosi, | f℥iss. |
| Morphinæ sulphatis, | gr. j. |
| Syrup. pruni Virg., | q. s. ad f℥v. |

M. Sig.: Two teaspoonfuls every hour or two for the relief of cough.

For bronchitis, especially of elderly persons, ipecacuanha can be combined thus with advantage:—

| | |
|---|---|
| ℞ Syrup. ipecacuanhæ, | f℥j. |
| Potassii nitratis, | ʒij. |
| Creosoti, | ♏v. |
| Glycerini, | |
| Aquæ aurantii florum, | āā f℥ij. |

M. Sig.: Two teaspoonfuls in water every two or three hours.

In croup, especially where the mucus is not expelled, but is swallowed or accumulates in the air-passages, an emetic dose of syrup of ipecac often gives great relief and may prevent suffocation. For cases of this kind it is much superior to tartar emetic or the compound syrup of squill, also containing this salt, which is too depressing. In delirium tremens, or acute alcoholic poisoning, ipecac produces evacuation of the contents of the stomach and stimulates the action of the liver. It is too slow in its action as an emetic to be of much service in other forms of poisoning. In dysentery, 40 to 60 grains are given with wonderfully successful results; if necessary to quiet the stomach an opiate is administered about twenty minutes previously; no liquids swallowed for an hour after the ipecac has been taken, and absolute rest in the recumbent posture observed. The same treatment is useful in cholera morbus and, presumably, in Asiatic cholera.

Ipecac deprived of its emetina has been found by East Indian physicians equally efficient in dysentery. It is administered in about the same doses as ipecacuanha and is less apt to excite nausea or vomiting. In dysenteric diarrhœa, when blood and mucus appear in the stools, small doses may be given, combined with opiates or Dover's powder. Ipecacuanha, with mercury and opium, often acts well in both diarrhœa and dysentery:—

℞ Pulveris ipecacuanhæ et opii, . . . . . . . ʒj.
Pilulæ hydrargyri, . . . . . . . . . . . gr. x.
Camphoræ,
Pulveris capsici,
Extracti kino, . . . . . . . . . . . āā gr. xv.
M. et ft. no. xxx.
Sig.: One or two pills every hour or two until relieved.

Ipecacuanha has been used in tuberculous diarrhœa with alleged advantage. It is said to have the power of restraining night-sweats.

Emetine has been successfully used in diarrhœa due to indigestion. It is given in the dose of $\frac{1}{250}$ grain, preceded by a calomel purge. Nausea disappears and diarrhœa is rapidly controlled.

Ipecacuanha is also used in fractional doses for insufficient excretion of bile and torpor of the liver and may be combined with a digitalis pill or other agents, as follows:—

℞ Pulv. ipecacuanhæ, . . . . . . . . . . gr. iv.
Quininæ hydrochlorat., . . . . . . . . . ʒj.
Pepsin., . . . . . . . . . . . . . gr. xxiv.
Olei eucalypti, . . . . . . . . . . . ♏iij.
M. et ft. pil. no. xxiv.
Sig.: Take one after meals.

Small doses of ipecacuanha, given after meals, are of service in flatulent dyspepsia. When the tongue is heavily coated and the stomach contains indigestible food, especially at the beginning of a fever, an emetic dose of ipecac will prove very serviceable in relieving symptoms; it is a means of treatment that has been allowed to fall into undeserved neglect. In the treatment of malarial poisoning, this method of stimulating the liver is very useful previous to the administration of quinine or other antiperiodics. It is of service likewise in the treatment of catarrhal jaundice.

In laryngismus stridulus, an emetic of syrup of ipecac usually aborts the paroxysm and affords time for the use of potassium bromide to produce its effects. Trousseau recommended its use in the puerperal state, in cases of post-partum hæmorrhage, and dysentery, etc. In other forms of hæmorrhage, such as epistaxis, menorrhagia, and metrorrhagia, ipecacuanha is serviceable when given in doses sufficient to provoke vomiting. Dr. C. Burland testifies to the value of ipecacuanha in controlling hæmatemesis. He administers it in the dose of a drachm or more, made into a bolus with enough glycerin to produce the necessary consistency.

An attack of asthma may be cut short by full doses of ipecac, and an occasional emetic is useful in whooping-cough and capillary bronchitis to dislodge the secretions.

The wine of ipecacuanha has been successfully employed in 10- or 15-drop doses for the purpose of overcoming uterine inertia in the first and second stages of labor. It is said that the drug does not excite tetanic contraction, but normal and regular expulsive efforts. Ipecacuanha seems to have some power to restrain colliquative sweats.

The **Euphorbia Ipecacuanha** (Euphorbiaceæ), Ipecacuanha spurge, growing in the eastern part of the United States, from New York southward, although belonging to a different natural order, yet contains in its root an emetico-cathartic principle, which renders it a good substitute for ipecac where emesis is required and catharsis is not objectionable. It is commonly administered in the form of powdered root, but a fluid extract may also be obtained. It is of more agreeable taste than ipecac.

## IRIS FLORENTINA.—Orris-Root.

**Pharmacology and Therapy.**—Several species of the genus Iris (Irideæ) furnish the rhizome known by the name of orris-root. It contains a volatile oil of violet color and pleasant odor, much used in perfumery; besides an acrid resin, starch, mucilage, etc. The powder, which is said to be alterative, cathartic, and diurectic, and is rarely employed internally, but is used in making sachets, tooth-powders, and in alcoholic tincture, in perfumery and flavoring extracts.

## IRIS (U. S. P.).—Iris, Blue Flag.

### *Preparations.*

*Extractum Iridis* (U. S. P.).—Extract of Iris. *Dose*, gr. ¼–j.

*Extractum Iridis Fluidum* (U. S. P.).—Fluid Extract of Iris. *Dose*, ♏xxx–f℥j.

*Tinctura Iridis.*—Tincture of Iris (saturated), made from fresh root. *Dose*, ♏x–f℥j.

*Iridin.*—An impure resin. *Dose*, gr. ss–iij.

**Pharmacology.**—The Iris versicolor (Irideæ) is a common inhabitant of moist places and borders of ponds, and is one of the most attractive among our wild flowers. It is a herbaceous perennial, with a thickened root-stock, which is the official portion—rhizome and rootlets. The flowers are large and showy, violet-blue, variegated with greenish-yellow and white, with purple veins; they appear in May and June. It contains an acrid resin, upon which its medicinal activity depends, besides ordinary vegetable principles. **Iridin** is an impure resin, precipitated from alcoholic tincture by water.

**Physiological Action.**—The powdered root, when fresh, is a powerful emetic and cathartic, less so after drying. It is a decided cholagogue, and also diuretic and alterative, having a stimulant action upon the intestinal glands. It is best given in combination with aromatics and milder purgatives.

**Therapy.**—In chronic hepatic derangements, especially of malarial origin, the preparations of iris are very useful, and particularly the recent saturated tincture. In duodenal catarrh, obstructive jaundice, bilious remittents, iris preparations are frequently used with advantage. In dropsy they are also useful, both as diuretic and cathartic. Iris, administered in small doses, is very beneficial in sick-headache dependent upon indigestion. In larger doses it has vermifuge properties, and may be used to expel the round worm, **ascaris lumbricoides.**

℞ Ext. iridis fld.,
Ext. hydrastis fld., . . . . . . . āā f℥ss.
Elixir. aromatic., . . . . . . . . . fʒj.
M. Sig.: Take a dessertspoonful in hot water before meals for indigestion.

## IZAL.

Izal is a by-product obtained in the manufacture of coke. It was found by Dr. Klein, of London, that a 1:200 solution was destructive, within five minutes, to various species of microbes. It is not irritant, however, in this strength to the human integument. This solution has been used for the purpose of disinfecting sponges and instruments, and for impregnating gauze intended as a dressing to wounds.

Izal has been experimentally employed by Dr. William Bruce Clarke with very favorable results. Wounds left after major operations healed promptly under its use. It was an excellent solution for the cleansing of abscess cavities, sinuses and fistulæ, in all of which it decidedly promoted repair. The solution was likewise serviceable in cystitis, and was employed as a mouth or throat wash after operations on those parts.

**JABORANDI.** See Pilocarpus.

## JALAPA (U. S. P.).—Jalap.

**Dose,** gr. viii–xx.

*Preparations.*

*Extractum Jalapæ* (U. S. P.).—Extract of Jalap. *Dose,* gr. ii–v.

*Pulvis Jalapæ Compositus* (U. S. P.).—Compound Powder of Jalap (jalap 35, cream of tartar 65 parts). *Dose,* gr. x–ʒj.

*Resina Jalapæ* (U. S. P.).—Resin of Jalap. *Dose,* gr. i–iv.

**Pharmacology.**—The tuberous root of Ipomœa Jalapa (Convolvulaceæ), obtained from Mexico, contains from 12 to 18 per cent. of resin, which is official and is composed of **Jalapin,** a soft resin soluble in ether, and **Convolvulin,** a hard resin insoluble in ether, the latter of which has been found to be the more active; also starch and sugar, of each about 18 per cent. According to Professor Poleck, jalapin is a resinous glucoside, and separates by the action of hydrochloric acid into sugar and jalapinolic acid. He states, moreover, that it is identical in composition and chemical properties with scammonin.

The pharmacopœia requires that the root shall contain at least 12 per cent. of resin. The extract is used in making the compound cathartic pills.

**Physiological Action.**—Jalapin is a hydragogue cathartic, increasing the intestinal secretions and the flow of bile; overdoses may produce hypercatharsis and prostration. Convolvulin is an irritant, and may cause gastric enteritis and collapse; it is a local purgative, and is not excreted in the urine or fæces, but is probably destroyed by oxidation or by the hepatic cells.

**Therapy.**—The compound powder of jalap is one of the best hydragogue cathartics for dropsy, either of heart or kidney disease; and in cases of pulmonary congestion and distended right heart, with lividity, shortness of breath, and so-called cardiac asthma, a teaspoonful of compound jalap-powder affords great relief.

In dropsy dependent upon cardiac or renal disease, Professor Joseph Jones, of New Orleans, employs with advantage a diuretic and purgative wine thus composed :—

| | |
|---|---|
| ℞ Extr. jalapæ fld., | fʒiij. |
| Extr. scill. fld., | f℥iij. |
| Extr. pilocarpi fld., | f℥j. |
| Extr. digitalis fld., | ♏xxx. |
| Potass. nitrat., | ʒiv. |
| Vini Angelicæ, | Oij. |

M. Sig.: A tablespoonful every three hours. The quantity can be gradually increased if necessary.

As an ordinary laxative the compound powder of jalap may be combined with compound liquorice-powder where the latter fails alone, and is a good cathartic for children. Jalap may be used as a cathartic after administration of santonin or calomel, or where a tæniacide has failed to bring away the parasite. As a purgative it is sometimes combined with calomel, but, as it acts more rapidly than the latter, the effect of the mercurial is lost unless it precedes the former from four to six hours. Jalap is not so rapid in its action as croton-oil, but is more manageable. In hæmorrhoids, it does not cause increased irritation, but relieves them by emptying the vessels above and clearing out the liver.

Convolvulin is an efficient purgative and may be prescribed in doses from 1½ to 3 grains.

## JAMBOL, or JAMBAL.

**Pharmacology and Therapy.**—The Syzygium jambolanum (Eugeniodeæ, Myrteæ) is a tree indigenous in tropical America and the West and East Indies, where the acid fruit is eaten as food and as a remedy for diarrhœa and diabetes by the natives. It has also been used to some extent in Europe in the form of an extract in the treatment of diabetes. In some experiments* made in Professor Binz's laboratory, it was shown by Dr. C. Graeser that in dogs in which diabetes had been artificially induced by the administration of phloridzin, the simultaneous exhibition of jambal reduced the proportion of sugar materially (80 to 85 per cent.). There were no signs of toxic action after administration of large doses, 6 to 18 grammes daily, of extracts partly made from the whole fruit and partly from the rind or kernel. Mr. Thomas Stephenson also finds that jambal possesses the power of checking the action of diastasic ferments in converting starch into grape-sugar. The result of his experiments was to show conclusively that the greatest influence over the action of diastase was exerted by a preparation of the fresh kernels by a process avoiding the use of heat. The difference in the preparations made use of by different observers probably explains the different results reported.

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* *Lancet*, November 2, 1889; *Therapeutic Gazette*, January, 1890.

Scott added powdered jambal to malt and starch and found that the formation of sugar was prevented. M. Villie, however, who repeated the experiment, obtained more sugar when jambal was present than when it was absent. Hildebrandt states as the result of his experiments that jambal prevents the action of plant diastase and the sugar-forming ferments in the blood-serum, saliva and pancreatic extract, but is without effect upon pepsin and trypsin.

Mahomed has published notes of a case in which the use of jambal resulted in the diminution of the sugar in the urine and, at the end of a week, in its entire disappearance. On discontinuing the drug the sugar returned, and on resuming the jambal it again disappeared. It appears, however, to have been only a mild case.* Many reports, for the most part favorable, have been made in regard to the efficacy of jambal in the treatment of diabetes mellitus. In the majority of cases the amount of urine was reduced, the proportion of sugar lessened and the general health improved under its use. In a number of instances this amendment has taken place in the absence of the usual regulation of diet. In pancreatic diabetes, on the other hand, Dujardin-Beaumetz asserts that the quantity of sugar in the urine is actually increased. This writer regards the drug as merely an adjuvant to the dietetic management of moderately severe cases of diabetes.

Though the evidence of different observers is not always in accord, yet from what has been published the drug certainly merits a trial and the closest study of its therapeutic worth.

In India, jambal has long been esteemed of value in diarrhœa.

**JEQUIRITY.** (See Abrus.)

**JUGLANS** (U. S. P.).—**Butternut.**
**Dose,** ʒi–ij.

*Preparations.*

*Extractum Juglandis* (U. S. P.).—Extract of Butternut. *Dose*, gr. v–xxx.

*Extractum Juglandis Fluidum.*—Fluid Extract of Butternut (alcoholic). *Dose*, fʒi–ij.

**Pharmacology.**—The bark of the root of Juglans cinerea (Juglandaceæ), a large tree of North America, collected in the autumn, contains **Nucin** or **Juglandic acid** (resembling crysophanic acid), also resin, volatile oil, and fixed oil and tannin.

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* *Practitioner*, December, 1888.

**Therapy.**—It is a mild cathartic, useful in chronic constipation and dysentery.

**Nut-oil** is the fixed oil obtained by expression from the crushed seeds of several species of Juglandaceæ. Walnuts and hickory-nuts yield about 25 per cent of a fine, bland, pleasant-tasting oil, which can be used in pharmacy, or in medicine for massage, like other fixed oils. It is a drying oil, containing linolein.*

A decoction of walnut leaves, used both externally and internally, is said by Dr. Rodionoff to be of value in scrofula.

## JUNIPERUS.—Juniper, Juniper-Berries.

### *Preparations.*

*Oleum Juniperi* (U. S. P.).—Oil of Juniper. *Dose,* ♏v–xx.

*Spiritus Juniperi* (U. S. P.).—Spirit of Juniper (oil of juniper 5 and alcohol 95 parts). *Dose,* f ʒ i–℥ j.

*Spiritus Juniperi Compositus* (U. S. P.).—Compound Spirit of Juniper (oil of juniper 8, oil of caraway 1, oil of fennel 1, alcohol 1400 and water q. s. ad 2000 parts). *Dose,* f ʒ ii–iv.

*Infusum Juniperi.*—Infusion of Juniper-Berries (℥ j to Oj). *Dose,* f ℥ ii–iv.

*Extractum Juniperi Fructus Fluidum.*—Fluid Extract of Juniper Berries (diluted alcohol). *Dose,* f ʒ ss–iss.

*Spiritus Genevæ.*—Gin. *Dose,* f ʒ j–℥ j.

**Pharmacology.**—The fruit of Juniperus communis (Coniferæ), an evergreen of this country and Northern Europe, contains from 2 to 2½ per cent. of a **volatile oil,** about 15 to 30 per cent. sugar, etc.; also a non-crystallizable principle, **Juniperin.** The volatile oil also exists in the leaves and other parts of the plant, and by macerating them in alcohol or spirits a liquor is produced, commonly known as gin, or spiritus Genevæ. As the commercial article is frequently adulterated with oil of turpentine and other ingredients known to the trade, the pharmacopœia offers a substitute in the compound spirit of juniper. The oil of juniper obtained from the wood is inferior to that distilled from the berries, which is the official form from which the spirit and compound spirit are made.

**Physiological Action.**—Juniper stimulates the kidneys, but in health, while the discharge of urea is increased, the urinary water is actually diminished temporarily; an overdose may produce strangury and suppression of urine. In diseased conditions, however, the flow of urine is much more free, and especially where dropsy exists. The oil is carminative as well as diuretic, and in alcoholic solution is a frequently-used stimulant. It is contra-indicated in acute inflammation of the kidneys.

**Therapy.**—In various forms of dropsies juniper is useful. In the form of an infusion, to which ½ ounce of cream of tartar is a good addition, a pint being drunk through the day, the effects are soon manifest in Bright's disease and its attendant œdema and effusions. A combination with potassium acetate is also very effective, as—

| | |
|---|---|
| ℞ Potassii acetatis, . . . . . . . . . | ʒ vj. |
| Spiritus juniperi comp., . . . . . . . | f ℥ iss. |
| Infusi scoparii, . . . . . . . . . | f ℥ ivss. |

M. et ft. sol.
Sig.: A tablespoonful three or four times a day.

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* A Companion to the U. S. Pharmacopœia, Oldberg & Wall, New York, 1887.

Juniper gives relief in passive conjestion of the kidneys and the lumbar pain which accompanies that condition. This remedy is inappropriate, however, in acute nephritis on account of its stimulant properties. In large doses it sometimes excites priapism, strangury, or hæmaturia. Benefit is obtained from juniper in chronic pyelitis, prostatorrhœa, and gleet. Chronic catarrh of the bladder is also relieved by its use.

The juice of the berries has been successfully used in doses of two or three teaspoonfuls as a diuretic for young children and in renal dropsy. The oil may be dropped in boiling water and inhaled to produce the same effect. In infantile colic a few drops of the compound spirit in hot water relieves flatulence and pain.

**Oleum Cadini,** the oil of cade, is obtained by the destructive distillation of juniper-wood; it is tarry and empyreumatic, and is useful as a stimulant application in chronic eczema and in psoriasis. In the latter malady, after the scales have been removed, Hebra's modification of Wilkinson's ointment often proves of considerable efficacy. The formula is as follows:—

℞ Sulphuris sublimati,
Olei cadini, . . . . . . . . . . āā ℥ss.
Saponis viridis,
Adipis, . . . . . . . . . . . āā ℥j.
Cretæ preparatæ, . . . . . . . . . ʒiiss.
M. et ft. ungt.

The following mixture, which can readily be weakened if it proves too irritant, has also been recommended:—

℞ Olei cadini, . . . . . . . . . . ℥xiv.
Tr. quillaiæ, . . . . . . . . . . fʒx.
Glycerit. amyli, . . . . . . . . . ℥xvj.
M.

**KAMALA** (U. S. P.).—**Kamala, Rottlera** (Ph., 1870).

**Pharmacology and Therapy.**—The glands and hairs from the capsules of Mallotus philippinensis (Euphorbiaceæ), a small tree of India and China, are used, mixed with molasses or other vehicle, as a vermicide. It also possesses purgative properties. For tape-worm from 1 to 2 drachms are given at a dose, with a little hyoscyamus to prevent griping. An ethereal extract deposits crystals of what is called **Rottlerin.** A fluid extract (not official) is also used to expel lumbricoid worms. In the form of ointment, kamala is used in the East in the treatment of scabies and ring-worm.

**KAVA-KAVA.**—**Ava-kava, Methysticum.**

**Dose,** ♏xv–ʒss; best in the form of a fluid extract.

**Pharmacology.**—The Piper methysticum (Piperaceæ) is a shrub of the Sandwich Islands, having a large root, which yields about 2½ per cent. of soft **resin** (consisting of two kinds, distinguished as **a** and **b**), about 1 per cent. of a neutral, crystalline principle, **methisticin** (or kavahin), and some yellow volatile oil. This resembles piperine and cubebin, and is probably inert, the medicinal qualities depending upon the resins and volatile oil. It is best given in the form of a tincture or fluid extract made with alcohol as a menstruum.

**Physiological Action.**—In the Sandwich Islands the natives prepare an intoxicating beverage by chewing the root and infusing it with water or cocoanut-milk to grace their festivals. In consequence of prolonged use Lutz has observed that the skin of the Islanders, especially upon the extremities, assumes a decidedly ichthyotic appearance associated with a certain degree of atrophy resembling that of old persons.

The fluid extract is diuretic and depressant. The peculiar effects of this drug do not seem to be entirely due to either of the resins which it contains, but no other active principle has yet been isolated.

The physiological action of kava-kava has been investigated by Lewin, Randolph, and others, and quite recently Dr. David Cerna has published an account of a series of experiments* upon the same subject. When the fluid extract or the resin is placed upon the tongue a burning sensation is at first produced, soon followed by an increase of saliva and local anæsthesia. The loss of sensation endures for hours and normal sensibility slowly returns. The same benumbing influence is exercised upon the cornea and conjunctiva by a local application. A few minims of a solution injected hypodermically caused complete anæsthesia in the neighboring parts. The loss of sensibility persisted for a week.

The mucous membrane is rendered anæmic. Taken internally in considerable quantity, it induces somnolence. As the result of his researches, Cerna concludes that kava-kava produces general anæsthesia, and is especially a powerful local anæsthetic. It diminishes and finally destroys the action of the afferent nerves by affecting their peripheral ends. Reflex action is diminished and ultimately abolished. Paralysis of spinal origin is an effect of the drug. The action of the heart is rendered slower and more powerful; arterial pressure is at first reduced and subsequently raised. Respiration is at first stimulated, afterward depressed, and finally paralyzed. Small doses of kava-kava slightly increase, while large quantities reduce, bodily temperature.

**Therapy.**—In cystitis and chronic gonorrhœa, kava-kava is often remarkably successful. Acute gonorrhœa, retention of urine and incontinence of urine have also been notably ameliorated by the exhibition of this remedy unaided by any other form of treatment. It is likewise beneficial in leucorrhœa and vaginitis. It has also been recommended for gout. It is suggested that the anæsthetic properties of this substance may prove useful to dentists, and that, though irritant to the conjunctiva, it may be employed subsequent to cocaine for the purpose of prolonging the anæsthesia due to the alkaloid, and may be used, also, to disguise the taste of bitter or nauseous medicines.

## KEFIR.

**Pharmacology.**—Kefir is a product of the fermentation of milk, brought to general professional notice by the writings of Russian physicians. It is prepared by the natives of the Caucasus by the addition of a ferment collected from a mountain-bush. The ferment consists of bacilli and yeast-cells, the latter alone being essential to the fermentation. Kefir is a pleasantly acid fluid, containing 8 parts of alcohol and 9 parts of lactic acid in 1000 parts.

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* *Therapeutic Gazette*, January 15, 1891.

**Therapy.**—Kefir is well tolerated by the stomach and has been employed with good results in the treatment of dyspepsia, gastric catarrh, gastric ulcer, anæmia, chlorosis, and scrofulosis. It is useful in maintaining nutrition in pulmonary tuberculosis and cancer of the stomach.

**KINO** (U. S. P.).—**Kino.**

**Dose,** gr. x–xx.

*Preparations.*

*Tinctura Kino* (U. S. P.).—Tincture of Kino (10 per cent.). *Dose,* f℥i–ij.

*Extractum Kino Liquidum.*—Liquid Extract of Kino (about 50 per cent.). *Dose,* ♏xv–xxx.

**Pharmacology.**—Kino is the inspissated juice of Pterocarpus marsupium (Leguminosæ), a tree of the East Indies. It occurs in fragments of a ruby-red color, without odor, of a sweetish, astringent taste; scarcely soluble in cold, but entirely soluble in boiling water; soluble also in alkalies. **Kinotannic acid** is the most important constituent; there are also present **Kinoin,** a crystalline neutral substance, **Pyrocatechin, Pectin,** etc. The official kino is the so-called Malabar kino; there are other varieties, notably one from Botany Bay, obtained from several species of eucalyptus.

**Physiological Action and Therapy.**—Kino is a mild astringent, useful in diarrhœa, especially with chalk mixture and paregoric. Kino, locally and internally, possesses some value as a hæmostatic, and is a serviceable remedy in pyrosis. The tincture is often an ingredient of injections in gonorrhœa, and may be applied as a stimulant dressing to chronic ulcers. The compound powder (Ph. Br.) is used for the same purpose (it contains kino 15, cinnamon 4, opium 1). It has 5 per cent. of opium, and is used in doses of 5 to 20 grains. Kino may also be employed as a gargle, but has no advantage over tannic acid for this purpose.

**KOLA-NUT.**

**Dose,** gr. v–ʒij, in the form of a paste.

**Pharmacology.**—The seeds of Sterculia acuminata (Sterculiaceæ) are used by the natives in various parts of Africa for the purpose of increasing bodily force and restoring impaired energy. The seeds are chewed, and from the powdered dried seeds an agreeable stimulant and nutritious beverage is prepared with milk and honey. The tree grows to the height of 30 to 60 feet, bears some resemblance to the horse-chestnut, is a native of the western coast of Africa, and is found as far inland as 500 or 600 miles. It has been introduced, and with success, into other tropical regions of Asia and South America. From 5 to 15 seeds, some red and others white, are contained in a single capsule. They contain a large proportion of caffeine or theine (2.348 per cent.) together with tannic acid and theobromine (0.023 per cent.), other constituents being sugar, albumin, cellulose, starch, fat, and fixed salts. According to the investigations of Dr. E. Knebel, confirmed by A. Hilger, the fresh nut contains no caffeine, but a glucoside which, by decomposition, gives rise to caffeine, glucose and kola-red.

These seeds have lately been employed in a number of clinical experiments. An alcoholic extract has been made by exhausting the fresh nuts with 5 parts of 60° alcohol and a wine by macerating in a sweet white wine for a fortnight. But neither of these preparations extract all the caffeine. A tincture and a syrup have also been made, though water is an imperfect menstruum on account of the starch contained in the seeds. According to Simmonds* there is also a false or bitter kola, the male kola, named also the Garcinia kola, the seeds of which are oval or cuneiform; these are four in number, contained in a large berry. The false kola-nuts are destitute of alkaloid.

**Physiological Action.**—The taste of the fresh seed is at first sweet, becoming astringent and finally bitter. From his investigations upon himself and others, R. H. Firth concludes that kola increases the secretion of urine, stimulates the nervous system and heart, and increases arterial tension. It prevents the feeling of exhaustion from exercise or hunger. It communicates an agreeable taste to water or food, and, according to Armitrous, renders tainted meat edible and clarifies polluted water by a mechanical action.

Dr. Kotliar studied the action of kola-nut upon seven healthy young men during periods of rest and work, a drachm of the powdered nut being given daily to each subject. Both during rest and work the assimilation of phosphorus and sulphur was increased. The metamorphosis of the same elements was diminished during rest and at work, but more particularly during rest. The breaking up of phosphorus and sulphur compounds during periods of repose and labor, as compared with that of nitrogenous compounds, was diminished. The assimilation of chlorine was increased during rest, but unaltered during work. The metamorphosis of chlorine was diminished during rest and work, especially in the latter case.

**Therapy.**—Kola exercises a preservative action upon the teeth and gums and promotes appetite and digestion. It favorably modifies the functions of the liver. It is, therefore, adapted to act as a remedy in dyspepsia, whether of gastric or hepatic origin. It relieves the vomiting, vertigo, and depression of sea-sickness.

For painful dyspepsia Dr. Monin recommends :—

| | |
|---|---|
| ℞ Tinct. opii camph., | f℥ss. |
| Tinct. kolæ, | fʒiiss. |
| Tinct. vanill., | fʒiiss. |
| Julep. gummos., | f℥iv. |

M. Sig.: Tablespoonful three times a day.

Its combined stomachic and astringent properties render it of service in the treatment of acute and chronic diarrhœa. In its native country it is thought to protect Europeans against affections of the liver, and the natives esteem it as a prophylactic against dysentery. It has been proposed as likely to be of service in cholera. As a heart-stimulant, it may be employed in weakened conditions of that organ, in fever, and in phthisis. Kola is useful in cardiac asystole and in the debility attendant upon convalescence from influenza. It is indirectly serviceable in disease of the heart as a diuretic. Dr. Chambord Henon reports a case in which the administration of kola-nut was apparently of great service in preventing the alarming palpitation and syncope to which a woman had, at every previous accouchement, been subject.

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* *Pharmaceutical Record*, January 5, 1891.

Its favorable influence upon the nervous system suggests its employment in neuralgia. It is stated that kola has a remarkable power of promoting cheerfulness, and may be very serviceably used in hypochondria and melancholia. It is probably of value in overcoming the taste for alcoholic liquors. Simmonds states that the false kola-seeds, when chewed, are an effectual remedy for cold in the head.

Kola has a tendency to cause wakefulness and for this reason it is advisable to avoid its use in the evening. Dujardin-Beaumetz finds kola of advantage in the treatment of diabetes mellitus, making use of the infusion or fluid extract in order to avoid the alcohol of the tincture and the starchy matter of the kola biscuits.

The following formulæ are taken from the columns of *Le Journal de Médicine de Paris*:—

| | | |
|---|---|---|
| ℞ Extr. cinchon., | | |
| Extr. kolæ, | āā | gr. lxxv. |
| Extr. rhei, | | gr. xxxviij. |
| Extr. nucis vom., | | gr. viiss. |
| Ferri arsenatis, | | gr. iij. |
| Pulv. kolæ, | | q. s. |

M. et div. in pil. no. c.
Sig.: Two pills with each meal.

| | | |
|---|---|---|
| ℞ Vini kolæ, | | |
| Vini cinchon., | | |
| Vini gentianæ, | | |
| Vini calumbæ, | āā | f℥ viij. |
| Liq. potass. arsenit., | | gtt. x. |
| Tinct. nucis vom., | | gtt. v. |

M. Sig.: A claretglassful after each meal.

**KRAMERIA** (U. S. P.).—**Krameria, Rhatany.**

**Dose**, gr. v–xx.

*Preparations.*

*Extractum Krameriæ* (U. S. P.).—Extract of Krameria. *Dose*, gr. i–x.

*Extractum Krameriæ Fluidum* (U. S. P.).—Fluid Extract of Krameria. *Dose*, ♏i–xx.

*Syrupus Krameriæ* (U. S. P.).—Syrup of Krameria. *Dose*, fʒ i–iv.

*Tinctura Krameriæ* (U. S. P.).—Tincture of Krameria (20 per cent.). *Dose*, fʒ i–iv.

*Trochisci Krameriæ* (U. S. P.).—Troches of Krameria (each, gr. j of extract). *Dose*, one or more.

**Pharmacology.**—Krameria is the root of Krameria triandra and of K. Ixina (Polygaleæ), growing in South America. It contains about 20 per cent. of **Kramerio-tannic acid**, which is the active constituent. The infusion (℥j to Oj), though not official, is a useful preparation.

**Physiological Action.**—It is a powerful astringent.

**Therapy.**—In Peru it is largely used as a remedy for bowel disorders, diarrhœa, dysentery, etc. The infusion is a satisfactory gargle for relaxed throat, and the lozenge is also used for this purpose. The tincture of krameria may be combined with chalk mixture in the treatment of summer diarrhœa. Krameria is employed as a systemic remedy in epistaxis, hæmatemesis, hæmaturia, and other forms of hæmorrhage. It is of service, both locally and internally, in hæmorrhoids and leucorrhœa, and the tincture or the fluid extract is used, diluted and in combination with other astringents, as an injection, in gonorrhœa. A mixture of the decoction and the tincture was recommended by Trousseau as an injection in fissure of the anus. The powdered extract enters into the composition of many tooth-powders.

**KUMYSS.—Koumiss, Milk-Wine.**

**Pharmacology.**—Originally made in Asia by the Tartars as an intoxicating drink by fermenting mares' milk, kumyss has been introduced into European medicine as a food and as a remedial agent. It can be made for medical use by adding a small piece of compressed yeast, to diluted cows' milk containing a small amount of grape-sugar; it should be kept in a cool place, with frequent agitation, and used on the fourth or fifth day.

The late Prof. S. W. Gross (*College and Clinical Record*) gave the following simple directions for preparing kumyss:—

Dissolve ½ ounce of grape-sugar in 4 ounces of water. Dissolve 20 grains of yeast-cake in 4 ounces of milk. Pour both into a quart bottle and fill nearly to the top with milk. Cork tightly, fastening the cork with wire. Put into a cool place and shake two or three times daily for three days. *Keep for use no longer than six days.*

A champagne-tap introduced through the cork is necessary. Kumyss contains about 16 per cent. of alcohol, and is a pleasant, acidulous drink.

**Physiological Action and Therapy.**—The combined action of the carbonic acid and alcohol in kumyss produces an exhilarant impression. It raises the arterial tension and assists in assimilation. It adds tone to the stomach, aids the appetite, excites the action of the kidneys and skin, and favors sleep. Kumyss, by reason of its utility as a nutriment during inflammatory action, is of great service in phthisis, scrofula, chronic bronchitis, and in the treatment of surgical cases. In an irritable stomach it is a most beneficial remedy in its sedative and nutritive effect.

In the nausea and vomiting of pregnancy, owing to the action just referred to, kumyss very often acts in a most happy manner, the nutrition and bodily vigor of patients being increased by the continued use of kumyss during this period. At the time of confinement, when nausea and vomiting supervenes, followed by exhaustion, kumyss will often assist in restoring the flagging powers. During the state of lactation kumyss will be very grateful, will assist the nutrition of the system, and will be productive of better and more nourishing milk. Thominski has observed a decidedly beneficial effect from the use of kumyss in two cases of irregular menstruation and in one case of abundant nasal hæmorrhage.

In convalescence from acute diseases, in diarrhœa and dysentery, kumyss will be serviceable to feeble digestion, and will aid in assimilation. In cholera infantum, gastro-intestinal diseases of childhood, and in fevers, kumyss is a most agreeable form of food. Kumyss serves as an excellent vehicle for the administration of lactic acid to children suffering with diarrhœa. D. H. Davies suggests the preparation of euonymized kumyss as suitable to cases of hepatic derangement attended by nausea and vomiting. It can be made by adding 3 drachms of fluid extract of euonymus to every pint of the diluted milk from which kumyss is obtained. In the same manner cocaine hydrochlorate may be incorporated with kumyss for the treatment of cancer of the stomach.

It is also an admirable remedy and food in acute and chronic alcoholism, in albuminuria, diabetes, gastralgia, gastric ulcer, and in the various forms of cancer and dyspepsia. Kumyss is especially useful in cachexia of kidney disease (f℥iv four or five times a day).

The amount of kumyss administered to each case should vary according to the disease. In some instances from 1 to 4 ounces can be given every one to three hours; in others as much as a good-sized glassful or two can be taken frequently during the day and night. The writer has administered as much as three or four quarts of kumyss a day in diseases attended with much exhaustion, and often with decidedly good effect.

**LACTUCARIUM** (U. S. P.).—**Lactucarium, Lettuce-Opium.**
**Dose,** gr. x–xx.

*Preparations.*

*Extractum Lactucarii Fluidum.*—Fluid Extract of Lactucarium. *Dose,* variable. ♏i–iij for a child, ♏x–fʒj for an adult.
*Tinctura Lactucarii* (U. S. P.).—Tincture of Lactucarium. *Dose,* ♏x–lx.
*Syrupus Lactucarii* (U. S. P.).—Syrup of Lactucarium. *Dose,* fʒi–℥iss.
*Glyceritum Lactucarii.*—Glycerite of Lactucarium. *Dose,* fʒii–iij.

**Pharmacology.**—The concrete milk-juice of Lactuca virosa (Compositæ) a wild variety of lettuce growing in Europe, but also found in garden lettuce, Lactuca sativa. The only important constituent is the mixed substance, **Lactucarium,** obtained by evaporation of the milky juice. It is in flattened pieces or cakes, of reddish-brown color, internally white or waxy-looking, of heavy, opium-like odor, and a bitter taste. It is administered in 10-grain doses. French lactucarium, being simply a blackish-brown extract of lettuce, is inferior to that of the pharmacopœias of the United States and England, which is made from the expressed juice. Lactucarium consists of **Lactucern, Lactucin,** and **Lactucic acid.** Mr. T. S. Dymond has made the interesting discovery that a small proportion of hyoscyamine is contained in lettuce. It is present both in the wild and cultivated species, exists in very minute amount in the young plants, but in the green extract of the British Pharmacopœia prepared from the flowering herb of Lactuca virosa, it occurs to the extent of 0.02 per cent.

The syrup is pleasant to the taste; a glycerite may be made of the same strength as the syrup, but using glycerin instead of simple syrup.

**Physiological Action.**—It is a feeble narcotic, and owes its reputation largely to the observation that eating lettuce causes drowsiness. Its preparations vary greatly in activity, but are not toxic, and are therefore much safer for children than those of opium. Some action upon the kidneys is also observed, and it allays spasmodic cough.

**Therapy.**—The syrup is used in cough mixtures for children, Aubergier's syrup having the reputation of being active and uniform in strength. To allay nervous irritability, and as a substitute for the soothing syrups containing morphine, it has decided value. The fluid extract may be used in elderly persons, or where there is an idiosyncrasy against opium, to fulfill the same ends.

Lactucin has been employed as a sedative and hypnotic in the dose of 1 or 2 grains.

**LAMINARIA.—Laminaria, Sea-tangle.**

**Pharmacology and Therapy.**—The small stems of the Laminaria digitata (Algæ), when dried, are cut into appropriate lengths and shape and their surface made smooth, to be used as substitutes for sponge tents in dilating the cervix uteri, owing to their property, when moistened, of swelling up to several times their original size.

**LAPPA** (U. S. P.).—**Burdock-Root.**

**Pharmacology.**—The seeds (achenes) and root of Arctium lappa and of some other species of arctium (Compositæ) contain a bitter principle, volatile oil, resin, mucilage, sugar, a little tannin, etc. There is no starch in burdock-root, but in its place inulin is found.

The root is used for similar purposes to those of sarsaparilla. A fluid extract of the seeds (dose, ♏xv–fʒj) and a tincture of the seeds (1 pound to 1 gallon) are employed; also an infusion or decoction of the seeds or root, but none of the preparations are official.

**Physiological Action and Therapy.**—Burdock is diaphoretic, diuretic, and laxative, without causing irritation. The fluid extract is used externally for swellings, hæmorrhoids, ulcers, etc., and internally for rheumatism, syphilis, and chronic skin diseases.

According to Squibb, the tincture * is a useful tonic and is curative in psoriasis.

**LAUROCERASUS.—Cherry-Laurel.**

*Preparation.*

*Aqua Laurocerasi.*—Cherry-Laurel Water. *Dose,* fʒss–ij.

**Pharmacology.**—The fresh leaves of Prunus laurocerasus (Rosaceæ) contain **Laurocerasin**, a compound of amygdalin and **amygdalic acid**, and also **Emulsin**, which, when in the presence of water, form a volatile oil (benzaldehyde) and hydrocyanic acid, to which it owes its medicinal qualities. Cherry-laurel water is distilled from the fresh leaves, bruised and macerated in water; it contains the volatile oil and hydrocyanic acid, but is of uncertain strength.

**Therapy.**—It is used in Europe (very rarely in this country except by foreign physicians) for the same purposes as bitter-almond water and chiefly as a vehicle for anodyne and antispasmodic remedies. A cherry-laurel ointment, consisting of 1 part of essence of cherry-laurel to 8 parts of lard, is used in Italy in painful affections, as neuralgia, herpes zoster, chronic rheumatism, and carcinoma.

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* Ephemeris, vol. i, p. 116.

### LAURUS.—Laurel, Bay, or Bay-Laurel.

*Preparation.*

*Unguentum Lauri.*—Laurel Ointment (suet 350 parts, rectified oil of amber 20, oil of turpentine 45, and expressed oil of bay-berries 585 parts).

**Pharmacology.**—The leaves and berries (Lauri folia and Lauri baccæ) of Laurus nobilis (Lauraceæ), a tree of Southern Europe, contain volatile oil, **Laurin,** or laurel-camphor, a liquid fixed oil, a solid fixed oil known as **Laurostearin,** and starch. The volatile oil of laurel-berries, consisting of a camphene and eugenic acid, is occasionally employed externally in rheumatism. By boiling the fresh fruit in water and using pressure, the expressed oil of laurel is obtained, which is used in the form of ointment as an anodyne. Leaves, berries, and oil are stimulant and narcotic. A laurel ointment is official in the French Codex. It is composed of 1 part each of fresh laurel-leaves and laurel-berries, with 2 parts of lard. This preparation is applicable to erythema, dermatitis, erysipelas, acute eczema, and superficial burns. The leaves are used in cooking for flavoring (bay leaves, bay-laurel leaves); they should not be confounded with the leaves of **Myrcia acris,** from which the volatile oil of bay is distilled, that is used as a perfume (and enters into spiritus myrciæ, or bay-rum), or **Myricæ Cerifera Cortex,**—bayberry bark.

### LAVANDULA.—Lavender, Lavender Flowers.

*Preparations.*

*Oleum Lavandulæ Florum* (U. S. P.).—Oil of Lavender Flowers. *Dose,* ♏iii–v.

*Spiritus Lavandulæ* (U. S. P.).—Spirit of Lavender (oil of lavender flowers 50, deodorized alcohol 950 parts). *Dose,* f℥ss–j.

*Tinctura Lavandulæ Composita* (U. S. P.).—Compound Tincture (formerly Spirit) of Lavender (oil of lavender 8, oil of rosemary 2, cassia cinnamon 20, cloves 5, nutmeg 10, red saunders 10, in alcohol, water and diluted alcohol to make 1000 parts). *Dose,* f℥ss–j.

**Pharmacology.**—The flowers of Lavandula vera (Labiatæ), much cultivated in England for their perfume, contain volatile oil, some resin, and tannin. The oil of lavender, distilled from the whole herb or flowering tops, is coarser than that distilled from the flowers alone; of the latter there are several varieties, differing in value and fineness. An inferior, greenish, turpentine-like oil, distilled from Lavandula spica, is known as oil of spike-lavender. The oil of lavender has the property of checking decomposition. The compound tincture is an elegant preparation of aromatics and stimulants.

Lavender is carminative and stimulant. It is useful in flatulence, nervous dyspepsia, gastralgia, colalgia, hysteria, and syncope. Lavender is said to be possessed of considerable hypnotic power. It is used in perfumery, and enters into spiritus odoratus, vinum aromaticum, liquor potassii arsenitis, and spiritus ammoniæ aromaticus.

### LEDUM.—Ledum, Wild Rosemary.

**Dose,** gr. xv–xxx.

**Pharmacology and Therapy.**—The small twigs, tops with undeveloped flowers and leaves of Ledum palustre (Ericaceæ), but **without** the fruit even partly formed, contain volatile oil, **Valerianic acid, Ericolein, Leditannic acid,** resin, etc., and are used in infusion, as marsh-tea. Ledum is said to be somewhat narcotic, astringent, and tonic; it is used externally to destroy parasites, and internally in diarrhœa and dysentery, gout, rheumatism, and chronic skin diseases.

Dr. R. Hilbert, of Sensburg, reports that an infusion of the leaves of this plant (1½ to 3 drachms to 8 ounces of water) acts as a good expectorant in bronchitis. It rapidly relieves the pain and fever, especially in juvenile patients. In chronic bronchitis it diminishes cough and facilitates expectoration. This writer regards ledum as especially valuable in bronchitis with emphysema occurring in aged persons, as it renders the secretion less viscid, stimulates the circulation and lessens dyspnœa.

**LEONURUS.—Leonurus, Motherwort.**

**Dose,** fʒi–ij, in fluid extract.

**Pharmacology and Therapy.**—The flowering tops and leaves of Leonurus cardiaca (Labiatæ) contain a bitter principle, some volatile oil, etc. It is used in recent infusion, and, as a fluid extract, with dilute alcohol, as a menstruum to promote the menstrual discharge and in suppression of the lochia. It is also deemed useful in hysterical pains.

**LEPTANDRA.** (U. S. P.).—**Leptandra, Veronica, Culver's Root.**

**Dose,** gr. xx.

*Preparations.*

*Extractum Leptandræ* (U. S. P.).—Extract of Leptandra. *Dose*, gr. iii–x.

*Extractum Leptandræ Fluidum* (U. S. P.).—Fluid Extract of Leptandra. *Dose*, fʒss–j.

**Pharmacology.**—The rhizome and root of Veronica Virginica (Scrophularineæ) contain a bitter principle, **Leptandrin**; also saponin, tannin, resin, starch, etc. What is ordinarily designated leptandrin is merely an impure resin or alcoholic extract. Leptandra is common in woods from Vermont to Wisconsin and southward.

**Physiological Action.**—Leptandra-root, or Culver's physic, is a cholagogue cathartic. It should be dried, for in its recent condition it acts too violently to be used. This extract is an eligible form in which to use the drug, which, in small doses, is tonic and laxative.

**Therapy.**—In indigestion, with deficiency of secretions and constipation, leptandra has been found useful and may be combined with podophyllum, which it resembles in its effects, or with aromatics. When the stools are clay-colored and show a deficiency of bile, this agent may be used to bring about bilious discharges, even when there is diarrhœa.

**LIMON.—Lemon.**

*Preparations.*

*Limonis Cortex* (U. S. P.).—Lemon-Peel. The rind of the recent fruit of Citrus limonum (Rutaceæ).

*Limonis Succus* (U. S. P.).—Lemon-Juice. The freshly-expressed juice of the ripe fruit of Citrus limonum.

### *Preparations from the Cortex, or Rind.*

*Oleum Limonis* (U. S. P.).—Oil of Lemon. Used for flavoring.
*Spiritus Limonis* (U. S. P.).—Spirit of Lemon. Used for flavoring.
*Syrupus Limonis.*—Syrup of Lemon. Used for flavoring.

### *Preparations from the Juice.*

*Mistura Potassii Citratis.*—Neutral Mixture. *Dose*, f ʒ ii–iv.

*Syrupus Acidi Citrici* (U. S. P.).—Syrup of Citric Acid. As a vehicle. *Dose*, f ʒ i–ij.

*Acidam Citricum* (U. S. P.).—Citric Acid. *Dose*, gr. v–xxx.

*Syrupus Limonis.*—Lemon Syrup. Contains both juice and rind. *Dose*, f ʒ i–℥ ss.

**Pharmacology.**—Lemons, owing to their pleasant flavor and agreeable acidity, are very useful in the sick-room. The rind is glandulous, and by expression yields an oil of great fragrancy, much superior to that obtained by distillation. Each lemon yields from 2 to 8 drachms of acidulous juice, containing citric acid (7 to 9 per cent.), besides phosphoric and malic acids, in combination partly with potassa and other bases. A solution of citric acid in water (gr. xxxiv to ℥j) corresponds in acidity with fresh lemon-juice, but not therapeutically on account of absence of other constituents. Half an ounce of lemon-juice should neutralize 25 grains of potassium bicarbonate, 20 of sodium bicarbonate, or 14 of ammonium carbonate. Lime-juice, obtained from a smaller fruit of the same genus (Citrus acris), closely resembles fresh lemon-juice, but acquires a peculiar, slightly musty taste from the wood in which it is imported. When fresh the rind of lemon, besides the oil above mentioned, contains a bitter, crystalline glucoside, **Hesperidin.** When preserved, boiled in syrup and dried (candied), lemon-peel is useful in flavoring, for cooking, etc.

**Therapy.**—Lemon-juice is applied to the surface of the skin to remove freckles or ephelides, moth-spots, sunburn, pruritis, and ink-stains. Used internally, lemon or lime-juice is antiscorbutic, probably owing to the presence of phosphoric acid or potash salts, as citric acid does not possess this property. It is now so constant a companion of voyagers by sea that scurvy is rarely seen, except where the regular ration of lemon- or lime-juice has been neglected. It is also curative in scurvy, and in various scorbutic manifestations upon the skin, or in the form of muscular pains. In some cases of chronic rheumatism, the administration of several ounces of lemon-juice daily affords marked relief. Lemon-juice has been likewise used in acute rheumatism with, at times, apparent good results. Lemonade, made by diluting lemon-juice with water and adding sugar, is a useful drink during convalescence; it increases the urinary water and reduces the acidity of the urine. Hot lemonade is useful as a diaphoretic in recent colds; its effects are increased by the addition of a little whisky or gin. Neutral mixture, made by neutralizing fresh lemon-juice by the addition of crystals of potassium bicarbonate, is useful as a refrigerant and to satisfy thirst in fevers.

In typhoid fever, Dujardin-Beaumetz advises the free use of a vinous lemonade, made according to the formula:—

| | | | |
|---|---|---|---|
| ℞ | Syrup. acid. citrici, | | f℥ij. |
| | Vini rubri, | | f℥viij. |
| | Ess. limonis, | | ♏xv. |
| | Aquæ, | q. s. ad | Oij. |

M.

Atheromatous changes in the arteries are retarded by the persistent use of lemon-juice, which is also useful in obesity. In Italy, an infusion of the lemon, the rind being incised to allow the juice to escape, is administered in ague and other malarial attacks attended by fever. Lemon-juice is regarded as of material assistance to other remedies in the treatment of torpidity of the liver and catarrhal jaundice.

**LINDERÆ CORDEX.—Lindera-Bark, Spicebush-Bark.**

**Dose,** ♏xxx–fʒj, in fluid extract.

**Pharmacology.**—The Benzoin odoriferum (Laurineæ), Lindera benzoin, or spicebush, is one of our common forest shrubs, belonging to the same natural order as the sassafras, the cinnamon, and the camphor tree. The bark and fruit contain a volatile oil, resin and the common vegetable principles, The bark has a pleasant, spicy taste, due to the oil.

**Physiological Action.**—It is aromatic, stimulant, and tonic, and a recent, hot, weak infusion is diaphoretic.

**Therapy.**—In some disorders of digestion the carminative and tonic effects are available; the infusion is used in chills and to abort a cold. A decoction of the inner bark made into an ointment with cold cream is recommended by Hyde as a valuable remedy in rhus poisoning.

**LINUM** (U. S. P.).—**Linseed, Flaxseed.**

*Preparation.*

*Oleum Lini* (U. S. P.).—Linseed-Oil.

**Pharmocology and Therapy.**—Flaxseed (Linum usitatissimum; natural order, Lineæ) contains mucilage and linolein.

A nitrogenous glucoside, which they have termed linamarin, has been obtained from this plant by MM. Jorissen and Hairs. Linamarin differs in several physical and chemical properties from amygdalin and occurs as colorless and odorless needles which have a very cooling and bitter taste. It is soluble in water and alcohol, but almost insoluble in ether. It is demulcent and emollient. A hot infusion (℥ss–Oj), flavored with liquorice-root or lemon-peel, is used in bronchial inflammations, as a diaphoretic and expectorant; also in cystitis, strangury, and hæmaturia. A plain infusion is an excellent enema for use in inflammation of the rectum, fissure, hæmorrhoids, etc. Flaxseed-tea is used as a demulcent drink in gastritis.

Ground flaxseed mixed with boiling water forms flaxseed poultice, which is spread at least half an inch in thickness upon muslin or flannel, and applied as hot as possible in order to relieve pain and congestion in peritonitis, and in pneumonia, pleurisy, etc., as jacket poultices, renewed every two or three hours. They should be covered with oiled silk to retain heat and moisture, and, if desired to increase the counter-irritant effect, a little dry mustard or a few drops of turpentine may be sprinkled over the surface. They afford great relief to the patient.

Laudanum, also, or lead-water and laudanum, are often used with a flaxseed poultice in inflammatory and painful affections. Flaxseed poultices are also applied to boils and abscesses to abort the process or to hasten ripening. They are also applied occasionally to ulcers and wounds to encourage granulations and bring about healthy action. Whole flaxseed, in ½-ounce doses, has been ordered in habitual constipation as a laxative.

The long-continued application of poultices is likely to bring out an eruption of small boils upon the skin, the result of hyperæmia and irritation. Poultices are often useful for temporary purposes, but too long applied are mischievous. The integument and the vessels subjected to their influence become relaxed, suppuration is prolonged, granulations rendered unhealthy, and the repair of ulcers or wounds retarded.

Oil of flaxseed is an old application to burns to exclude the air; combined with lime-water, it forms Carron-oil, which was formerly used largely for this purpose, having been originally used at an iron works of that name in Scotland, where the workmen were frequently burned. It is dirty and soon smells badly, and has been driven out of use by petrolatum and Listerism.

## LIPPIA MEXICANA.

**Pharmacology.**—Lippia Mexicana (Verbenaceæ), a creeping, evergreen shrub, with very long roots and numerous branches, grows abundantly in Southern Mexico. Its medicinal virtues reside in the leaves and stalks, especially in the leaves, which possess an agreeable, sweetish, and aromatic taste. The plant contains a small proportion of tannic acid, an ethereal oil, and a volatile camphor termed **Lippiol.** A fluid extract and a tincture have been prepared, the dose of the former being from 5 to 30 minims, and of the latter from ½ to 1 fluidrachm.

**Physiological Action.**—Lippia causes a sensation of warmth in the stomach, and in large doses may give rise to vomiting. This is succeeded by free perspiration and sleepiness.

**Therapy.**—The drug is endowed with valuable expectorant properties. It allays irritation of the bronchial mucous membrane and promotes healthy secretion. Its effects are rapidly manifested. Lippia is useful in both acute and chronic bronchitis. In the former it allays the cough, and in the latter it liquefies the viscid secretion and facilitates expectoration. It is of service in the cough of phthisis, has an excellent effect in irritative cough, and in whooping-cough mitigates the paroxysms, though it is not able to shorten the course of the disease. It has, in some instances, proved useful in spasmodic asthma.

## LIQUIDAMBAR.—Liquidambar, Sweet Gum.

**Pharmacology.**—The Liquidambar styraciflua (Hamamelaceæ) of North and Central America supplies a brownish-yellow balsam, resembling storax, and containing stryrol (3½ per cent.), cinnamic acid (5 per cent.), styracin, and resin. A good substitute for the imported drugs which it resembles,—storax, tolu, and benzoin,—and used for the same purposes.

## LITHIUM.

### *Salts.*

*Lithii Benzoas* (U. S. P.).—Lithium Benzoate. *Dose*, gr. v–xx.
*Lithii Bromidum* (U. S. P.).—Lithium Bromide. *Dose*, gr. v–xx.
*Lithii Carbonas* (U. S. P.).—Lithium Carbonate. *Dose*, gr. v–xx.
*Lithii Citras* (U. S. P.).—Lithium Citrate. *Dose*, gr. v–xx.
*Lithii Citras Effervescens* (U. S. P.).—Effervescent Lithium Citrate. *Dose*, ʒ i–ij.
*Lithii Salicylas* (U. S. P.).—Lithium Salycilate. *Dose*, gr. v–xx.
*Lithii Iodidum.*—Lithium Iodide. *Dose*, gr. i–v.
*Lithii Guaiacas.*—Lithium Guaiacate. *Dose*, gr. i–v.

**Pharmacology.**—Lithium is a metal of an alkali, generally prepared from the native silicate, or **Lipidolite.** It decomposes water at ordinary temperatures, but without melting like sodium, and is less easily oxidized than either sodium or potassium. The metal, which is not official, resembles tin. It was first obtained by Bunsen by electrolysis of the chloride. Its salts are soluble in water, but the carbonate and phosphate only slightly so.

**Physiological Action.**—Lithium urate is freely soluble, and therefore when lithium, in combination with the vegetable acids, is administered, these salts are decomposed in the system and the lithium combines with uric acid, renders it soluble, and thus facilitates its expulsion from the body. These salts are also diuretic, and the administration of lithium produces an increase in the urinary secretion. Lithium carbonate promotes the assimilation and metabolism of nitrogenous material and increases the elimination of urea. Some mineral waters largely owe their medicinal effects to the small proportion of these salts which they contain, being rendered more effective by natural combination with other salts. According to the experiments of M. Binet, toxic doses of lithium occasion arrest of the heart in diastole.

**Therapy.**—In the uric-acid diathesis, the several salts of lithium are used with great advantage, even where chalky deposits exist. It has been also stated that they can dissolve uric-acid calculi in the urinary passages or bladder. Where there is vesical catarrh and alkaline urine, the benzoate is the best salt to use, since it renders the urine more acid; where the urine is already too acid the other official salts are preferable. In gouty subjects, especially those suffering with indigestion, lithium renders good service, and can be given in the form of an effervescent salt or in Vichy water. In gravel, lithium affords prompt relief. Dr. Duche states that the local action of lithium is beneficial to gouty joints and that gouty conjunctivitis is relieved by frequently washing the eyes with a 1 : 500 solution of lithium carbonate.

The salts of lithium have likewise been advantageously employed in chronic articular and muscular rheumatism. In rheumatoid arthritis they sometimes seem to delay the progress of the malady.

M. Vulpian has found lithium salicylate of service in relieving the pain which, after acute rheumatism, often lingers in the joints when the swelling has disappeared. He believes it is especially beneficial in fibrous rheumatism. In progressive subacute rheumatism he has seen it produce great improvement. In the chronic articular form of the disease this salt has a marked effect upon the joints.

In gout, subacute and chronic rheumatism, as well as in irritable bladder from excess of acid and in uric-acid calculi, lithium may be given thus:—

℞ Lithii citratis, . . . . . . . . . . . ʒiss.
Liquor. ammonii acetatis,
Syrupi limonis, . . . . . . . . . āā f℥ij.
M. Sig.: Two teaspoonfuls in water every two or three hours for rheumatism and gout.

℞ Lithii iodidi, . . . . . . . . . . . . ʒj.
Syrup. sarsaparillæ comp., . . . . . . . . f℥v.
M. Sig.: A half to a tablespoonful three or four times a day for syphilis.

℞ Lithii guaiacat.,
Quininæ sulphatis, . . . . . . . . āā gr. xl.
M. et ft. capsulæ no. xij.
Sig.: A capsule or two every two or three hours for rheumatism and gout.

℞ Lithii bromidi, . . . . . . . . . . . ʒiiss.
Tinct. cardamom. comp., . . . . . . . . f℥j.
Glycerini, . . . . . . . . . . . . f℥iij.
M. Sig.: Two teaspoonfuls in water every hour or two hours for rheumatism and gout.

℞ Lithii benzoat., . . . . . . . . . . . ʒij.
Tinct. belladonnæ folior., . . . . . . . . ♏lxxij.
Extracti tritici repentis fl., . . . . . . . . f℥iij.
M. Sig.: A teaspoonful every two or three hours for irritable bladder, depending on excess of acid, and in uric-acid calculi.

In pruriginous eczema caused by gout, a pill composed as follows may be given with advantage:—

℞ Sodii benzoat.,
Lithii benzoat.,
Extr. gentian., . . . . . . . . . . āā gr. j.
Glycerin., . . . . . . . . . . . . q. s.
M. Sig.: One pill three or four times a day.

A combination of lithium carbonate with sodium bicarbonate is praised by Dr. C. Lange as an excellent application in severe general paræsthesia.

In glycosuria, the combination of arsenic with a lithia-water has been vaunted as curative. The late Dujardin-Beaumetz suggested that the addition of strontium lactate to a lithia-water bids fair to prove of advantage in the treatment of diabetes mellitus. Lithium bromide has been found beneficial in epilepsy by Weir Mitchell, who states that it will in some cases succeed after failure of potassium or sodium bromide. The same writer regards its hypnotic power as superior to that of the potassium bromide. The lithium should always be administered in a large excess of water, and distilled water is better for this purpose on account of its diuretic properties. The Hygeia lithia-water is a definite solution of lithium in distilled water, and is more reliable than many of the commercial, natural lithia-waters. Lithium iodide contains a large proportion of iodine, and is a good method of administering this remedy, the only objection being its high cost. Woodbury* recommends the administration of a solution of lithium iodide by electricity, or the cataphoric action of the galvanic current in tubercular syphilides and other local inflammatory exudations and infiltration, and suggests its application in cancer.

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* Transactions of the College of Physicians of Philadelphia, 1890, and *Medical News.*

**Uricedin.**—A mixture or combination of potassium citrate, sodium sulphate, sodium chloride, and lithium citrate has been designated as uricedin. It is a white, granular powder, soluble in water. It is reported to be of value in the treatment of the uric-acid diathesis and can be taken in daily doses as high as 300 grains without any ill effects.

## LITMUS.

**Pharmacology.**—A blue pigment from Rocella tinctoria (Lichenes), imparting its blue coloring-matter, **Orcein,** to water and alcohol. Paper stained with a solution changes its color to red in the presence of an acid ; the blue color is restored by plunging the paper in an alkaline solution. Hence we have blue and red test-papers for acids and for alkalies.

## LOBELIA (U. S. P.).—Lobelia.

**Dose**, gr. viii–xx, as an emetic.

### *Preparations.*

*Acetum Lobeliæ.*—Vinegar of Lobelia (10 per cent.). *Dose*, ♏x–fʒj.
*Tinctura Lobeliæ* (U. S. P.). Tincture of Lobelia (20 per cent.). *Dose*, ♏v–fʒj.
*Extractum Lobeliæ Fluidum* (U. S. P.).—Fluid Extract of Lobelia. *Dose*, ♏i–x.
*Lobelina.*—Impure Alcoholic Extract. *Dose*, gr. ss–j.

**Pharmacology.**—Lobelia consists of the leaves and tops of Lobelia inflata (Lobeliaceæ) collected after a portion of the capsules have become inflated. It is a small herb, common by the waysides, with alternate leaves, an erect, hairy stem, with blue flowers in the axils of the leaves. The herb has a slight odor and a burning, tobacco-like taste. The chief constituent is a liquid alkaloid, **Lobeline,** combined with **Lobelic acid** and **Lobelacrin.** It forms crystallizable salts. The seeds contain about 30 per cent. of oil. The preparation sold as lobelin is an impure resin or powdered extract.

**Physiological Action.**—Lobelia has no local action, but there is some danger that it may be absorbed and produce systemic effects if applied too freely to the skin. Internally, it is a powerful depressant in large doses, and sialagogue, expectorant, emetic, and purgative, according to circumstances. This drug frequently produces headache and vertigo, and may cause death from exhaustion, or by paralysis of the respiratory centre. It depresses the circulation and action of the heart, favors diaphoresis through the violent emesis which it causes, and also lowers temperature. Lobelia also promotes the discharge of urine and has some narcotic properties. Lobeline first increases, then diminishes, and finally abolishes reflex action. It generally increases arterial pressure and stimulates the respiration. In overdoses it causes death by respiratory failure.

Should alarming symptoms follow an overdose of lobelia the proper treatment consists in washing out the stomach with a solution of tannic acid, the external application of heat, hypodermic injection of alcohol, ether, ammonia, or strychnine. Subsequently, moderate doses of opium will allay vomiting.

**Therapy.**—An infusion of lobelia (1 ounce to the pint) has been used as a lotion in dermatitis due to rhus toxicodendron. It has valuable antispasmodic powers, though it is generally employed in too small doses in asthma. Ringer administers a drachm of the tincture every hour, or 10 minims every ten minutes, immediately at the onset of a paroxysm of asthma with marked benefit in shortening the attack. Lobelia may be employed thus for asthma:—

| | | |
|---|---|---|
| ℞ Tinct. lobeliæ, | | f℥j. |
| Tinct. hyoscyami, | | f℥ss. |
| Aquæ camphoræ, | | |
| Spiritus ætheris nitrosi, | āā | f℥j. |
| Syrupi pruni Virg., | | f℥ss. |

M. Sig.: A teaspoonful in water every half-hour or hour until relieved.

| | |
|---|---|
| ℞ Aceti lobeliæ, | fʒss. |
| Sodii bromidi, | ʒv. |
| Syrup. ipecacuanhæ, | f℥ss. |
| Glycerini, | f℥iv. |

M. Sig.: Two teaspoonfuls every one or two hours.

Lobelia should not be employed as an emetic, as it produces too much nausea and depression, and when so used has caused death. For the same reason lobelia is detrimental when dyspnœa is occasioned by disease of the heart.

Lobelia is esteemed of value in spasmodic laryngitis. The spasmodic stage of whooping-cough is often ameliorated and shortened by the exhibition of this remedy. It is, relatively, better tolerated by children than by adults. On account of its expectorant properties, lobelia is of service in bronchitis, especially when the mucus is dry, the cough hard and barking, or the expectoration is extremely tough and hard to raise. In the treatment of whooping-cough and bronchitis, lobelia may be administered as follows:—

| | | |
|---|---|---|
| ℞ Tinct. lobeliæ, | | fʒij. |
| Sodii bromidi, | | ʒiij. |
| Spiritus ætheris nitrosi, | | f℥j. |
| Syrup. limonis, | q. s. ad | f℥iij. |

M. Sig.: A half to a teaspoonful every one or two hours to a child for whooping-cough.

| | |
|---|---|
| ℞ Tinct. lobeliæ, | f℥ss. |
| Ammonii iodidi, | ʒij. |
| Spiritus ætheris comp., | f℥ij. |
| Syrup. tolutani, | f℥iiss. |

M. Sig.: Two teaspoonfuls every two or three hours for bronchitis.

In constipation and impaction, the tincture of lobelia in 1-minim doses every hour promotes peristalsis and stimulates intestinal secretions; or a 10-drop dose may be given at bed-time, acting in a similar way to tobacco.

| | | |
|---|---|---|
| ℞ Acetanilid., | | ʒij. |
| Tinct. lobeliæ, | | fʒij. |
| Syr. eriodictyi aromat., | q. s. ad | f℥iij. |

M. Sig.: Take a teaspoonful every quarter of an hour during attack of asthma until relieved.

In the dose of 1 to 6 grains lobeline sulphate, a yellowish-white powder, is said to produce good results in asthma and bronchitis.

Lobeline has been employed with success, principally in the treatment of spasmodic asthma, by Dr. Silva Nunes, who claims that it is free from nauseant or irritant properties and can be subcutaneously injected. He has used it in doses of $\frac{1}{6}$ to $\frac{5}{6}$ grain for children and $\frac{5}{6}$ to $6\frac{1}{3}$ grains for adults. Dr. Nunes writes that the administration of lobeline produced a cure in eight cases of tetanus.

**LORETIN.—Meta-iodo-ortho-oxyquinoline-ana-sulphonic Acid.**

**Pharmacology.**—Loretin is an iodine compound originally prepared by Professor Claus, of Freiburg, as a substitute for iodoform. It is a yellow crystalline powder, entirely free from odor, slightly soluble in water and alcohol, and insoluble, or nearly so, in ether and oils. With metallic oxides it combines to form salts. Its alkaline salts are readily soluble in water. The calcium salt does not dissolve in water.

**Physiological Action and Therapy.**—Loretin possesses antiseptic properties, does not irritate the skin, and is said to be devoid of toxic quality. This substance has been employed as a surgical dressing by Professor Schinzinger, of Freiburg. Mixed with a small quantity of calcined magnesia it can be serviceably dusted upon wounds or insufflated into cavities. A 2- to 5-per-cent. solution of the loretin-sodium salt is useful in the irrigation of wounds. Gauze impregnated with the calcium salt answers a good purpose as a dry dressing. Collodion containing loretin forms a good application to many wounds, and when painted upon a large erysipelatous surface was soon followed by a marked reduction of fever. The same preparation was beneficial in lupus after cauterization had been practised. Loretin powder was beneficially applied to burns and eczema. Professor Schinzinger has employed it with satisfactory results as a dressing after major applications. A favorable report of the usefulness of this remedy in veterinary surgery has been made by G. Fenzling.

Bismuth loretin is a useful application to chronic ulcers, cutaneous lesions of syphilitic origin and moist eczema, being employed in these cases as a powder, 10-per-cent. ointment and paste. The bismuth compound has also been given with success internally in tubercular diarrhœa.

**LOSOPHAN.—Tri-Iodo-Metacresol.**

**Pharmacology.**—Losophan is the name given to the product resulting from the action of iodine on oxy-toluyl acid in the presence of an alkali. It contains 80 per cent. of iodine and occurs in the form of white needles which melt at 250.7° F. Losophan is slightly soluble in alcohol, insoluble in water, readily soluble in ether, chloroform, benzol, and, at a temperature above 140° F., in fixed oils. Losophan is soluble in a dilute solution of sodium hydrate, but is changed by a concentrated solution into a greenish-black amorphous body.

**Physiological Action.**—The effects of losophan must be closely observed, as it is a decided irritant.

**Therapy.**—The value of this substance as a topical remedy in diseases of the skin was investigated by Dr. Edmund Saalfeld, of Berlin. He employed it in the form of a 1-per-cent. solution in 3 parts of alcohol and 1 of water, and as a 1- to 3-per-cent. ointment. It was found of service in different forms of tinea, in chronic infiltrated eczema, squamous and fissured eczema. In prurigo and paræsthesia, losophan relieved itching. The application of a 1-per-cent. losophan ointment accomplished good results in certain cases of sycosis. It was useful, likewise, in acne and rosacea. In pediculosis and scabies it sometimes acted as a parasiticide. It is inapplicable to acute inflammatory diseases of the skin. Losophal is recommended by Dr. Descottes as a serviceable application to leg-ulcers, chancres and chancroids. He employed solutions and ointments containing 8, 10 or 20 per cent. without perceiving any irritation of the skin.

**LUPULINUM** (U. S. P.).—**Lupulin.**

**Pharmacology.**—The glandular powder separated from the strobiles of Humulus lupulus (Urticaceæ), or hops. (See Humulus.)

**LYCOPERDON.—Puff-Ball.** Lycoperdon solidum or Giganteum (Fungi) in powder is hæmostatic. It is credited with narcotic properties, but has been occasionally used for food.

**LYCOPODIUM** (U. S. P.).—**Lycopodium.**

**Pharmacology.**—The spores of Lycopodium clavatum and of other species of lycopodium (Lycopodiaceæ); they contain nearly 50 per cent. of oil.

**Physiological Action.**—Lycopodium, given internally, had been said in the past to have diuretic and antispasmodic action. Merrell ("Digest of Materia Medica") states[*] that the eclectics claim that lycopodium acts as a stimulant to the sympathetic visceral nerves, and therefore is of value in functional diseases of the organs under their control. Greene believes that lycopodium stimulates the liver, thus lessening the work of the kidneys, and that it has an anæsthetic effect upon the mucous membranes.

**Therapy.**—Lycopodium is a bland powder, and, if not contaminated by fraudulent addition of starch, is an excellent dusting-powder for intertrigo, or to prevent excoriations, especially in infants.

A tincture of lycopodium has been made by subjecting the powder to prolonged trituration with sugar of milk, after which it readily dissolves in alcohol. This preparation, in ½-drachm doses, is commended by Hurry, Fenwick and others as of value in incontinence of urine among adults. Greene states that flatulent dyspepsia, attended by a copious deposit of uric acid in the urine, is markedly benefited by this tincture.[†]

Lycopodium has also been employed for the treatment of rheumatism, dyspepsia, pulmonary and renal diseases. Sectarian physicians use it triturated with sugar of milk in minute doses for affections of the mucous tract, particularly dyspepsia, pyrosis, ileo-colitis, and for diseases of the urinary organs.

**LYCOPUS.—Bugle-Weed.**

**Dose,** fʒi–iv, in infusion or fluid extract.

**Pharmacology.**—The Lycopus Virginicus (Labiatæ) is a small herb

[*] *The Medical Standard,* Chicago, January, 1891.

[†] *British Medical Journal,* November 29, 1890.

common in wet places, resembling the mints, but wanting their aroma. The whole herb is used in decoction or infusion, but a fluid extract is the most eligible form in which to give it. It contains a volatile oil, with a little resin and tannin.

**Physiological Action and Therapy.**—Bugle-weed is astringent and sedative. It has been used in pulmonary disorders and phthisis to allay fever, cough and expectoration. Bugle-weed is likewise stated to check hæmorrhage from the lungs and other organs.

It reduces the force and frequency of the heart's action, and acts as a sedative, and in large doses is depressant to the nervous system. By virtue of the volatile oil it is somewhat carminative, and in small doses is considered tonic. It has been used in organic and functional heart disease, and in exophthalmus by Dr. Hector.* It is of service in spasmodic cough in combination with belladonna, but is rarely used. Probably when its composition and physiological properties are better understood, it may be better appreciated.

**MACIS** (U. S. P.).—**Mace.**

The arillode of the seed of Myristica fragrans (Myristicaceæ) is used principally for flavoring purposes. (See Myristica.)

## MAGNESIUM.

### *Salts and Preparations.*

*Magnesia* (U. S. P.).—Light Magnesia, Calcined Magnesia. *Dose*, ʒi–iv.

*Magnesia Ponderosa* (U. S. P.).—Heavy Magnesia. *Dose*, ʒss–iv.

*Magnesii Carbonas* (U. S. P.).—Magnesium Carbonate. *Dose*, ℥ss–ij.

*Magnesii Sulphas* (U. S. P.).—Magnesium Sulphate. Epsom Salts. *Dose*, ʒj–℥j.

*Magnesii Sulphis.*—Magnesium Sulphite. *Dose*, gr. xv–xxx.

*Trochisci Magnesiæ.*—Troches of Magnesia (each containing gr. iij). *Dose*, two or more.

*Liquor Magnesii Citratis* (U. S. P.).—Solution of Magnesium Citrate (dispensed in bottles containing 1 pint, effervescing when opened). *Dose*, f℥iv–xvj.

*Mistura Magnesiæ et Asafœtidæ.*—Mixture of Magnesia and Asafetida† (magnes. carb. 5, tr. asafœtida 7, tinct. of opium 1, sugar 16, water q. s. ad. 100 parts). *Dose*, fʒss–j.

*Magnesii Citras Effervescens* (U. S. P.).—Effervescent Magnesium Citrate. *Dose*, ʒi–iv.

*Ferri Oxidum Hydratum cum Magnesia* (U. S. P.)—See Iron.

*Pulvis Rhei Compositus* (U. S. P.).—See Rhubarb.

**Pharmacology.**—Magnesium is a light, silver-like metal, which, rolled in thin plates or ribbons, can be ignited, and will burn with a brilliant, white flame, forming a white smoke of the oxide. Magnesium carbonate is of two varieties, one heavier than the other; by calcination in a crucible they yield the two forms of magnesium oxide and heavy magnesia. Magnesium carbonate and the oxides are white in color, alkaline, insoluble, and tasteless, or nearly so. The sulphate is in colorless crystals, of a bitter taste, and quite soluble in water; it occurs native, and is a constituent of sea-water. It enters into the compound infusion of senna. The sulphite is a white, crystalline powder, obtained from the preceding, of slightly bitter taste, soluble in 20 parts of water. It oxidizes upon exposure to the air.

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* *Chicago Medical Times*, June, 1889.

† This is known as Dewees' Carminative; a similar preparation, Dalby's Carminative, contains 1¼ grains of opium in each ounce.

**Physiological Action.**—Magnesia (or calcined magnesia, as it is commonly called) and the carbonate have a slightly astringent effect upon the skin. When taken into the stomach, they are antacid and laxative. It may be used as an antidote to acids, and also in poisoning by phosphorus, copper, or arsenic; for the latter an official combination with ferric hydrate is provided. The citrate and sulphate are saline cathartics; the latter has no cholagogue effect, as was formerly thought, but it is a powerful irritant to the intestinal glands.

As a metallic poison M. Binet has demonstrated that magnesia arrests the heart in diastole and causes a precocious paralysis of the peripheral nervous system. It was shown by Claude Bernard that magnesium sulphate produces a purgative effect when injected into a vein.

**Therapy.**—Magnesium carbonate, which comes in small cubes, is used to dry the skin and prevent chafing or excoriation. Internally it is an antacid for indigestion, heartburn and pyrosis, and is used as a laxative for infants. Sick-headache, dependent upon gastric acidity, is often relieved by the administration of magnesium carbonate. Magnesia ponderosa is a convenient form in which to administer the oxide; it may be given suspended in orange-juice or milk. Magnesia has been used with variable success in sympathetic vomiting and the vomiting of pregnancy. It is of service in neutralizing uric acid, and may, therefore, be employed in lithiasis, though inferior in this condition to lithium. In adults, if constantly administered, it may form large concretions in the intestines. The citrate is more purgative, and, in the official effervescent salt and solution, is a pleasant cathartic for simple evacuation of the bowels. The sulphate is more active, causing free watery discharges. It may be given in repeated small doses, every hour, in order to overcome fæcal impaction; also in the constipation of lead poisoning:—

| | |
|---|---|
| ℞ Magnesii sulphatis, . . . . . . . . | ʒij. |
| Morphinæ sulphatis, . . . . . . . . | gr. j. |
| Aquæ menthæ piperitæ, . . . . . . . | f℥iij. |

M. Sig.: A tablespoonful every two hours in lead colic.

Dr. Matthew Hay advocates the use of magnesium sulphate in the treatment of pleural and other serous infusions, administering 1 or 2 ounces at a dose and restricting the fluids drunk. The citrate and sulphate cause little, if any, irritation, and may safely be used in enteritis or in peritonitis to keep the bowels open. In many acute febrile disorders small doses of these salines are beneficial, and in atonic conditions they may be combined with iron. The purgative mineral waters, Friedrichshall, Pullna, Seidlitz, Hunjadi Janos, owe their property principally to magnesium sulphate. The bitter taste of the Epsom salt is covered by adding some coffee to its solution. It is the cathartic to administer in cases of the peculiar diarrhœa caused by impacted masses of fæces in the colon, and in dysentery it proves very serviceable associated with aromatic sulphuric acid and laudanum. In acute dysentery, magnesium sulphate sometimes acts remarkably well, often removing fever, the blood and mucus from the stools, together with the tenesmus.

Dr. A. W. D. Leahy, who has treated ninety-five cases of acute dysentery with magnesium sulphate, with only two deaths, recommends the remedy, combined as follows: "Take a sufficient quantity of sulphate of magnesia to saturate 7 fluidounces of water, and to this solution add 1 ounce of diluted sulphuric acid. The dose of this is a tablespoonful every hour or two in a wineglassful of water until it operates. Sulphate of morphine may be added, or starch enemata with laudanum may be employed."*

The addition of a small quantity of fluid extract of liquorice completely disguises the taste of the salt.

That a small dose of Epsom salt hypodermically injected produces a purgative effect, first asserted by Luton, has lately received demonstration by Dr. J. Percy Wade. The dose injected varied from 2 to 4½ grains. The small was found to be as efficacious as the larger dose. The procedure occasioned no local reaction. A small dose repeated within a short time had a better effect than a single dose of larger size. The method was successful in 67 per cent. and in only two patients was it a constant failure. This practice might, with advantage, be adopted when the stomach is intolerant. In repeating these experiments Fincke failed to obtain an equal degree of success, the proportion of cases in which a purgative effect was produced amounting only to 18 per cent. In anæmia and chlorosis, which Clarke attributes to fæcal intoxication, the following combination forms a useful tonic laxative; it is known as **Mistura ferro-salina** :—

| | |
|---|---|
| ℞ Magnesii sulphatis, | ℥j. |
| Potassii bitartratis, | ʒj. |
| Ferri sulphat. exsiccat., | gr. x. |
| Aquæ, | Oij. |

M. Sig.: A wineglassful half an hour before breakfast each morning.

Where a more decided purgative effect is desired, the remedies should be given in more concentrated form, thus: equal parts of Rochelle and Epsom salts may be taken, say, each a teaspoonful, dissolved in a small quantity of water.

Epsom salt relieves congestion of the kidneys, general anasarca, the œdema of lung or brain which may occur in Bright's disease, ascites, uræmia, rectal and pelvic hæmorrhage, especially when accompanied by constipation. It is likewise of service in stricture or cancer of the rectum and fissure of the anus by liquefying the fæcal passages. This and other saline purgatives possess the valuable property of being able to act painlessly upon the bowels of a patient who is fully under the influence of opium, a fact which renders them additionally useful in rectal carcinoma. When the stomach is too irritable to permit its administration by the mouth, magnesium sulphate may be given in the dose of 2 ounces by enema with complete success. Epsom salt is likewise of service in the treatment of lead colic.

Magnesium sulphite has been recommended as a remedy for infectious dyspepsia and inflammatory or febrile diseases of infectious origin. This salt has been found useful, likewise, in diphtheria. It is given in the form of a tablet, allowed to dissolve slowly in the mouth, or the affected parts are dusted with the powdered drug. It seems to promote a rapid disappearance of the false membrane.

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* *London Lancet*, October 4, 1890.

A sulpho-carbolate has likewise been introduced to fulfill the same indications. Magnesium sulphate and carbonate are serviceable given internally for the treatment of warts.

The carminative mixture of magnesia and asafœtida should be used with care in infants on account of the opium which it contains.

### MAGNOLIA.—Magnolia.

**Dose,** ♏xxx–fʒj of a fluid extract.

**Pharmacology.**—The bark of Magnolia glauca, M. acuminata, and M. tripetala (Magnoliaceæ), all indigenous trees of our Eastern and Southern States. The drug contains, besides resin and tannin, a bitter, crystallizable, neutral principle, **Magnolin,** soluble in alcohol, but not in water. A fluid extract made with alcohol is the best preparation.

**Physiological Action.**—An aromatic bitter, which can be used in appropriate dose as a tonic or as an antiperiodic. Diaphoretic properties are also ascribed to magnolia.

**Therapy.**—Magnolia is used in debilitated conditions of the system attending malarial attacks, rheumatism, etc. In intermittent fevers it has been used successfully as a substitute for quinine.

### MAIDIS STIGMATA.—Corn-Silk.

*Preparations.*

*Extractum Stigmatorum Maidis Fluidum.*—Fluid Extract of Corn-Silk. *Dose,* fʒi–ij.

*Vinum Stigmatorum Maidis.*—Wine of Corn-Silk. *Dose,* f℥ss–j.

*Syrupus Stigmatorum Maidis.*—Syrup of Corn-Silk. *Dose,* f℥ss–j.

**Pharmacology.**—The styles and stigmas (Stigmata Maidis, corn-silk) of Zea Mays, Linnė (Gramineæ), maize, or Indian corn, gathered when the tassel has shed its pollen are now official under the title of Zea. They are said to contain an active principle which is termed **Maizenic acid,** which has been recommended for use in doses of $\frac{1}{8}$ grain.

The plant is too well known to need any description. A native of America, it has been extensively cultivated in all temperate climates.

**Physiological Action and Therapy.**—The preparations of corn-silk are palatable and well tolerated by the stomach. Its principal action is as a diuretic, and it likewise seems to exert a sedative action upon the urinary passages. When œdema is associated with an enfeebled condition of the heart, corn-silk, by exciting diuresis, acts indirectly as a heart-tonic; the pulse becomes regular and increases in force, while arterial tension is raised. Corn-silk is of service in congestion of the kidney, chronic nephritis and pyelitis. During its administration albuminuria is lessened and the excretion of urea is augmented. It also answers a good purpose in suppression of urine. In lithiasis, renal colic, and hæmaturia corn-silk has been found of benefit.

It is useful in uric acid and phosphatic gravel. Irritability of the bladder, acute and chronic cystitis (especially the latter), retention of urine, and prostatitis are ameliorated by this remedy. According to

Dufau it is contra-indicated in acute traumatic cystitis and gonorrhœal cystitis, increasing the pain of the malady. Other observers, however, report good results from its use in cystitis dependent upon gonorrhœa or stricture. Some, after having thoroughly washed out the bladder, employ the fluid extract of corn-silk diluted with water as an injection, with asserted good results. Others speak favorably of its use as an internal remedy in acute gonorrhœa. It has been given with success in nocturnal incontinence of urine. In œdema of the lower extremities, associated with disease of the heart and in general dropsy from heart or kidney disease, corn-silk is serviceable alone or combined thus:—

| | |
|---|---|
| ℞ Extracti stigmatorum maidis fl., . . . . . . . | f℥ iss. |
| Extracti taraxaci fl., | |
| Infusi digitalis, . . . . . . . . . . āā | f℥ iij. |

M. Sig.: Two teaspoonfuls in water every three or four hours.

| | |
|---|---|
| ℞ Extracti stigmatorum maidis fl., . . . . . . . | f℥ ij. |
| Potassii bitartratis, . . . . . . . . . . . | ʒ iij. |
| Spiritus ætheris nitrosi, . . . . . . . . . . | f℥ ij. |

M. Sig.: A half a tablespoonful every two or three hours.

**Corn-husk.**—Dr. J. W. Pruitt, of Russelville, Ark., asserts that a distilled extract prepared from the husk of Indian corn is an excellent remedy in chronic malaria. It is said to control temperature, allay irritability of the stomach, regulate the functions of the liver and kidneys and reduce enlargement of the spleen. It often exerts a mild diuretic influence. The extract is clear and transparent, resembling boiled green corn in odor and taste. It can be preserved by the addition of alcohol and glycerin and is administered in the dose of 1 or 2 drachms every two or three hours.

## MAIDIS USTILAGO.—Corn-Smut.

### *Preparation.*

*Extractum Ustilaginis Fluidum.*—Fluid Extract of Ustilago. *Dose,* ♏x–fʒj.

**Pharmacology and Therapy.**—Ustilago, or corn-smut, is a fungus resembling ergot, growing upon all parts of the Zea Mays. It should be preserved in a dry state, and should not be kept longer than a year. Corn-smut contains about 5 per cent. of an amorphous, reddish-brown substance resembling sclerotic acid.

The physiological action of ustilago has been studied by Dr. James Mitchell, who ascertained that it destroys consciousness, paralyzes first the sensory tract of the cord and subsequently the motor centres of the cord and motor nerves.

The fluid extract is used in a similar manner to ergot, in order to stimulate the contractions of the uterus during and after labor. Dr. Dorland states that ustilago excites clonic rather than tonic contractions of the womb during labor and is, therefore, to be preferred to ergot. Estachy has given this remedy with success in hæmoptysis and spermatorrhœa.

The usual dose is about 30 grains, or 15 to 75 minims of a fluid extract.

**MALAKINE.—Salicyl-paraphenetidine.**

**Dose**, gr. v–xv.

**Pharmacology.**—Malakine is the name bestowed upon a combination of salicylic aldehyde with paraphenetidine and is closely related in chemical composition to phenacetin. The compound appears in the form of small, silky needles, of a yellow color, insoluble in water, slightly soluble in cold alcohol, but readily dissolving in boiling alcohol. It is insoluble in alkaline carbonates, but dissolves in a soda-lye, forming a soda-combination of an intense yellow color. Malakine is decomposed by the mineral acids even when these are considerably diluted. It contains about 50 per cent. of salicylic acid. The latter substance, consequently, operates in the nascent state and apparently in smaller doses than when administered by the mouth under its own form.

**Physiological Action and Therapy.**—The effects of this drug have been investigated by Dr. Jaquet, of Bale,* who found that it exerted no influence upon the respiration, heart or blood-pressure of rabbits. That it was absorbed when taken into the stomach was shown by the presence of salicylic acid in the urine. It is decomposed by the gastric juice and is insoluble in the intestinal fluids. It is slowly broken up in the stomach and the absorption of its components proceeds gradually, for which reason its action is not manifested till after the lapse of a certain time. The remedy is well borne. Montagnon asserts that malakine has a diuretic effect and facilitates the elimination of uric acid.

In daily doses of 1 to 1½ drachms malakine has a beneficial action in rheumatism. The temperature is reduced on the second or third day of its administration, the local inflammation is diminished and the pain gradually lessened. It does not cause, as far as has yet been observed, any buzzing in the ears, loss of appetite or vomiting. Abundant sweating has sometimes been seen at the period of crisis and in one case Dr. Von Bauer observed unpleasant symptoms of collapse after eight doses of 8 grains each had been taken at hourly intervals.

The fall of temperature produced by this substance generally begins about two hours after a dose has been taken. The temperature slowly decreases, reaches a minimum at the end of three to four hours, when it commences to ascend. Malakine is not especially efficacious in the violent and persistent hyperpyrexia of the eruptive fevers and pneumonia. It renders the most efficient service in the later stages of typhoid fever and in the fever of tuberculosis. It generally proved beneficial in pleurisy and peritonitis. Malakine is thought to be particularly appropriate for use in chronic maladies and when the patient is enfeebled, on account of its freedom from depressant effect. According to Dr. Von Bauer, of Vienna, its antipyretic influence is less than that of antipyrin and phenacetin. Favorable results have also been obtained from the use of malakine in neuralgic affections. Malakine affords relief in habitual headaches, as in those of chlorosis.

**MALTUM.—Malt.**

*Preparations.*

*Extractum Malti.*—Extract of Malt. *Dose*, fʒi–iv.
*Extractum Malti Diastasicum.*—Diastasic Extract of Malt. *Dose*, fʒj–℥ij.

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* *Le Progrès Medical*, No. 51, 1892; *The Medical Bulletin*, February, 1894.

**Pharmacology.**—Malt is the seed of Hordeum distichum (Gramineæ) caused to enter the incipient stage of germination by artificial means and dried. Extract of malt is made with water at a moderate heat and evaporated by means of a vacuum apparatus to the consistency of thick honey. The method adopted in making the "diastasic" extract of malt, the author is informed by Mr. Louis Genois, a Philadelphia chemist, who prepares an admirable form of it, is to macerate well-malted barley in warm water for several hours, until the starchy matter has been changed to dextrine and maltose; the infusion is then simmered with fresh hops at a temperature under 160° F., in order to retain the diastase and other albuminoids unimpaired, and the resulting liquid subjected to fermentation until the percentage of extractive matter amounts to about 12 per cent., and that of alcohol to about 4 per cent. This takes from seventy-five to one hundred days.

When properly made, the extract and diastasic extract of malt not only contain all the nutritive substances of malted barley, but also a peculiar ferment (diastase), which has the power of converting starch to the soluble form, thus assisting in the digestion of amylaceous food.

The liquid malt extract, resembling honey in density, is a good vehicle for iron, the hypophosphites, quinine, etc.

**Therapy.**—Extract of malt is a valuable food, in concentrated form, and easily assimilated. It is pleasant to the taste, can be eaten upon bread or mixed with milk, and agrees with the digestive organs. It forms, with an equal quantity of good codliver-oil, an emulsion which children readily take, and which is useful in convalescence or wasting diseases. The water may be entirely extracted in the vacuum apparatus, giving us dry extract of malt, which is the basis of some largely-used food preparations for young children and invalids. The other form of liquid malt just referred to is made by fermentation, and several varieties of this malt are sold, varying in alcoholic strength from the smallest traces to 8 or 10 per cent., making, in fact, a beer. A good liquid malt is a valuable remedy in cases of general debility, deficient digestive power, or loss of appetite. It is probably one of the best agents for increasing muscular tissue and augmenting fat; many persons gain considerable weight from a malt course. The use of malt liquors has been already referred to under the head of alcohol.

## MANACA.

**Dose,** ♏v–xx, in fluid extract.

**Pharmacology.**—Brunfelsia hopeana (Scrophularineæ), Manaca or Mercurio vegetal, is a Brazilian shrub, the root of which possesses medicinal virtues. The bark of the root, when reduced to powder, has a yellowish-brown color and an odor which recalls that of corn-meal. An energetic alkaloid, difficult to isolate in a state of purity, has been discovered by Dragendorff. Manaca is official in the Brazilian dispensatories, the dose of the powdered root being given as 8 to 20 grains. In this country a fluid extract has been made and may be given in doses of 5 to 20 minims.

**Physiological Action.**—According to the investigations of Dr. E. P. Brewer,* of Norwich, Conn., manaca has no influence upon the brain or special senses, but stimulates the motor centres of the spinal cord, and in full doses abolishes the reflex function of the cord. It depresses the cardiac and respiratory reflex centres and stimulates the glands, especially the salivary, gastric, intestinal, and cutaneous; also the liver and kidneys. Signs that its physiological action is produced are, in man, a feeling of band-like constriction around the head, nausea, and profuse perspiration. When these symptoms manifest themselves the remedy should be suspended or reduced in quantity. In its home, manaca is regarded as purgative, diuretic, and emmenagogue; also antisyphilitic and antirheumatic. In small doses it is resolvent, in large doses an acrid poison.

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* *Therapeutic Gazette*, 1882, p. 326.

**Therapy.**—Manaca has been principally used as a remedy in rheumatism. In the acute form of this disease, the articular pain and swelling not infrequently subside rapidly after the development of the physiological effects of the drug. In a considerable proportion of cases, chronic rheumatism is notably ameliorated by the administration of manaca. In muscular rheumatism this drug is likewise serviceable and may be profitably combined with potassium iodide and cimicifuga, as in the following prescription:—

℞ Potassii iodidi, . . . . . . . . . ʒ iss.
Extract. cimicifugæ fl.,
Extract. manacæ fl., . . . . . . . āā f ʒ iss.
Syrup. sarsaparillæ comp., . . . . . q. s. ad f ℥ iv.
M. Sig.: A tablespoonful four times a day.

In neuralgia of rheumatic origin, manaca may sometimes be used with anvantage. In scrofulous manifestations and in secondary syphilis, it has been administered with asserted good effects. From its action upon the secretions, Dr. Brewer infers that it might be of benefit in gastric and gastro-duodenal catarrh, and jaundice dependent upon the latter condition, as well as in simple jaundice due to inaction of the liver.

## MANGANUM.—Manganese.

### *Preparations.*

*Mangani Dioxidum* (U. S. P.).—Manganese Dioxide. Black Oxide of Manganese. *Dose*, gr. ii–x.

*Mangani Sulphas* (U. S. P.).—Manganese Sulphate. *Dose*, gr. ii–v.

*Potassii Permanganas* (U. S. P.)—Potassium Permanganate. *Dose*, gr. ss–j.

**Pharmacology.**—Manganese is whitish gray, very hard and almost as infusible as platinum, but in the metallic state is not used in medicine or surgery. It exists in small quantity in the blood and bile, in company with iron. The dioxide or black oxide, treated with hydrochloric acid, yields manganous chloride, water, and chlorine, and is sometimes used to obtain chlorine in the sick-room. When heated with potassium chlorate it undergoes no change, but favors the steady evolution of oxygen-gas from the potassium salt, and this method is generally followed for the production of oxygen on a small scale for laboratory purposes.

**Physiological Action.**—The sulphate is an emetic and purgative in doses of 1 or 2 drachms, and has decided cholagogue properties; in smaller doses it may be used as a hepatic stimulant. Overdoses of manganese salts, especially if long continued, depress the system, lower the heart-action, favor fatty degeneration of the muscles and of the liver, and reduce blood-pressure. Excessive doses occasion gastro-enteritis. These salts are intestinal irritants, and the black oxide has emmenagogue properties. Small doses favor hæmatosis, acting like iron, as a tonic. Potassium permanganate is an oxidizing agent and a generator of ozone; it is a valuable antiseptic and disinfectant. In the stomach it arrests fermentation, but probably is at once decomposed, so that it is not absorbed into the circulation in its own form; but it, nevertheless, does exercise some systemic effect and is considered a good emmenagogue.

**Therapy.**—In solution, gr. i–v to each ounce of water, or even more dilute, the permanganate is useful as a deodorant to foul wounds, compound fractures, and ulcers; it is also injected into the nose in ozæna, or used as a mouth-wash in diphtheria, scarlatina, necrosis of jaw, cancer of the tongue, and conditions causing foul breath. In bromidrosis (fetid perspiration) of the feet, sponging with permanganate solution and the use of a drying-powder of starch and salicylic acid will often correct the condition. Injections of permanganate are sometimes slightly irritating, or even caustic, and they should not be used in gunshot wounds of the abdomen or abcesses connected with the peritoneal cavity, for fear of injurious consequences. In treating purulent discharges from the external ear the permanganate is thought to favor perforation of the tympanic membrane, and if used at all here it should be in very dilute solution. Dr. Albert Terson has found solutions of potassium permanganate useful in purulent ophthalmia. He employs a solution varying from 1 : 2000 to 1 : 5000.

In the strength of 2 grains to the ounce, permanganate has been used with success as an injection in gonorrhœa and leucorrhœa. An ointment containing manganese dioxide has been used in tinea, scabies, and porrigo. M. Galewouski, of Paris, has reported good results from the use of baths of potassium permanganate in the treatment of small-pox. In the treatment of disorders of the uterine functions many practitioners speak highly of the manganese salts, especially when the trouble is due to functional and not to any mechanical or obstructive cause. Dr. John N. Upshur, of Richmond, Va., has observed benefit in membranous dysmenorrhœa from the use of the oxide (gr. ij each) in gelatin-coated pills, given four or five times daily. The permanganate is often not well borne by the stomach. Manganese dioxide is also of service in amenorrhœa, or sudden suppression of the menses as a result of cold, and when the menstrual discharge is scanty and irregular. Manganese is useful in anæmia and chlorosis, particularly when given in conjunction with iron:—

| | |
|---|---|
| ℞ Potassii permanganatis, . . . . . . . . . | gr. v. |
| Mass. ferri carbonatis, | |
| Quininæ sulphatis, . . . . . . . . . āā | gr. x. |

M. et ft. pil. no. x.
Sig.: A pill three or four times a day.

As an emmenagogue in chlorosis, Dr. Homer C. Bloom highly recommends the following prescription:—

| | | |
|---|---|---|
| ℞ Ferri peptonat., | | gr. xij. |
| Mangani peptonat., | | gr. ij. |
| Acid. oxalici, | | gr. ij. |
| Alcohol., | | f℥ iij. |
| Aquæ, | q. s. ad | f℥ iv. |

M. Sig.: Two drachms three times a day.

An unofficial syrup of the iodide of iron and manganese is a good alterative tonic in scrofula and the debility due to prolonged suppuration. The oxide, in doses of 10 or 15 grains, is recommended by Dr. Leared in gastrodynia and pyrosis. The same preparation relieves catarrhal or malarial jaundice, especially when combined as follows:—

| | |
|---|---|
| ℞ Mangani oxidi nig., | ʒ ss. |
| Resinæ podophylli, | gr. ij. |
| Extract. belladonnæ alc., | gr. j. |

M. et ft. capsulæ no. x.
Sig.: A capsule three or four times a day, in catarrhal jaundice.

The permanganate is of avail in flatulent dyspepsia and lithiasis. It has occasionally produced good results in acute rheumatism, and has been employed, with varying success, in a number of infectious disorders, as scarlet fever, diphtheria, erysipelas, septicæmia and pyæmia. In the first two named, this remedy, in solution, is applied to the throat with advantage. It is also recommended, locally and internally; in snake-bites and in erysipelas the local application of a solution containing 2 or 3 drachms to a pint of water is beneficial.

Dr. William Moor, of New York, has shown that potassium permanganate is a direct chemical antidote for morphine. When solutions of the two substances are brought into contact the potassium permanganate is decomposed, gives up a portion of its oxygen, which seeks the morphine and effects a change, the character of which is yet undetermined, in the composition of the alkaloid and renders it harmless. The presence of albuminoids and peptones does not interfere with this reaction. An equal quantity, grain for grain, of permanganate is antidotal to morphine. Dr. Moor, though personally very susceptible to morphine, has taken, without the slightest inconvenience, 3 grains of morphine followed, thirty seconds later, by 4 grains of the permanganate, both in aqueous solution. In cases of poisoning by opium, laudanum or the uncombined alkaloid, he advises acidulation of the antidotal solution with diluted sulphuric acid or white vinegar in order that the insoluble morphine be converted into a soluble salt. To secure the most positive results from this plan of treatment it is necessary that the antidote should act upon the alkaloid before absorption has occurred. This fact promises to limit the usefulness of the discovery, but, from Professor Hitzig's demonstration that morphine which had been subcutaneously injected into dogs was secreted by the glandular lining of the stomach, Dr. Moor has strong reason to believe that the administration of permanganate will be of beneficial effect even after absorption of the morphine has taken place. A number of cases of opium or morphine poisoning which have been treated by means of potassium permanganate seem to show that it may be efficient when some time has elapsed since the poison was swallowed. This method promises to be a valuable addition to our antidotal therapeutics.

Dr. Moor has experimented with other alkaloids, but finds that potassium permanganate is without effect on atropine, cocaine, veratrine, pilocarpine, aconitine and strychnine.

Professor Bokai recommends the administration of potassium permanganate in phosphorus poisoning upon the ground that it converts the phosphorus into orthophosphoric acid, which is free from toxic action. Dr. Hognos, of Buda-Pesth, has successfully treated in this manner two cases, in both of which a large quantity of phosphorus had been taken. After the stomach had been washed out with tepid water about a pint of a 0.1 per cent. solution of permanganate was injected into the stomach and allowed to remain.

Antal has experimentally found that animals to which muscarine, strychnine, colchicum, oil of savin and oxalic acid had been administered, followed by a ½- to ⅓- per-cent solution of permanganate, recovered, but animals to which the antidote was not given perished.

Experiments upon animals have led Dr. J. V. Kossa to believe that potassium permanganate is an efficient antidote to hydrocyanic acid and potassium cyanide.

Manganese sulphate has been used in chronic rheumatism and neuralgia, but with doubtful results.

## MANGOSTANA.—Mangosteen.

**Pharmacology**.—The rind of the fruit of the mango, or Garcinia mangostana (Guttiferæ), growing in India, contains tannin and a bitter, crystallizable principle, **Mangostin**. The fruit is about the size of a small orange; the rind is hard, dark brown, smooth, inodorous, with bitter, astringent taste.

**Therapy**.—Used in diarrhœa and dysentery; also in the form of decoction, as an astringent, in sore throat, nasal catarrh, leucorrhœa, etc. A fluid extract of mango (dose, fʒss–j), made from the bark of Mangifera Indica, of the same natural order as the preceding, has very much the same properties and is used for the same purposes. It is also recommended as a hæmostatic.

## MANNA (U. S. P.).—Manna.

**Dose**, ℥j.

**Pharmacology**.—Manna is the concrete saccharine exudation of the Fraxinus ornus (Oleaceæ), or manna-ash of Italy, Sicily and Asia Minor; also growing elsewhere, but yielding manna only in southern climates. Other sources of manna exist, as the tamarisk, oak and larch, and a small, leguminous plant of India (Alhagi manna); but neither of these is of any importance compared with that derived from the flowering ash tree, which is the universally-known manna, both commercially and medicinally. It contains **Mannite** (70 to 80 per cent.), a sugar-like substance, and traces of **Fraxin**, a neutral, bitter substance found in the bark of several species of ash; also glucose, resin, mucilage, etc. The flake-manna is the selected, homogeneous, clear masses; manna, in sorts, contains more or less foreign material, such as straw, chips, etc. The best sort is scarce and expensive. There are no official preparations, except that manna is a constituent of compound infusion of senna

(U.S.P.), or black draught, which a former generation of physicians especially favored (consisting of senna 6, manna 12, magnesium sulphate 12, fennel 2, boiling water q. s. ad 100 parts.)

**Therapy.**—Manna is laxative in doses of an ounce or an ounce and a half for adults, but is liable to cause flatulence and colic. It has been used for children, boiled in milk, alone or combined with senna, or it may be eaten as a sort of sugar, a drachm or two at a time. Molasses-candy is also a good laxative, and is considerably cheaper.

### MANZANITA.

**Pharmacology.**—The Arctostaphylos glauca (Ericaceæ) is a native of California. Its leaves possess medicinal properties, due to **tannin, arbutin,** and probably, also, **ericolin** and **ursone,** resembling uva ursa in composition and medicinal effects.

**Physiological Action.**—The drug is astringent, and in small doses tonic and carminative. It is decidedly diuretic.

**Therapy.**—Manzanita is useful in various affections of the urinary tract, pyelitis, cystitis, stone in the kidneys or bladder; also in strangury, incontinence of urine, irritation of bladder, etc. It is best given in the form of a fluid extract (dilute alcoholic) in doses of fʒss–ij, four to six times a day.

### MARANTA.—Arrowroot-Starch.

**Pharmacology and Therapy.**—The fecula from the rhizome of the Maranta arundinaceæ (Cannaceæ), of the West Indies and South America, consists wholly of a beautifully-white starch in fine granules. It is used in preparing nourishing articles of food for the sick, with milk, eggs, etc.

### MARRUBIUM (U. S. P.).—Horehound.

**Pharmacology.**—The leaves and tops of Marrubium vulgare (Labiatæ), a small herb of Europe and America; contains a bitter principle, **Marrubiin,** with a peculiar **volatile oil,** resin, tannin, etc. It is best given as fluid extract (dose, fʒi–ij).

**Therapy.**—Horehound is employed as a bitter tonic and stomachic, and as an expectorant, diaphoretic, laxative, and diuretic. It is popular in confectionery as cough-drops, used for sore-throat, cough, and catarrhal conditions of the air-passages. When a diaphoretic effect is desired, the herb may be used in infusion (℥j to Oj), taken hot in recent colds. The cold decoction is serviceable in chronic pulmonary affections.

### MASTICHE (U. S. P.).—Mastic.

**Pharmacology.**—A concrete, resinous exudation from Pistachia lentiscus (Anacardieæ), consisting of **Mastichic acid** (90 per cent.), soluble in alcohol, and another resin, **Mastichin,** soluble in ether. It enters into the official pills of aloes and mastich, and has no other application at present in medicine, except that it may be used as a temporary filling for decayed teeth, the ethereal solution being used to saturate a small plug of absorbent cotton, which is pressed into the cavity. Mastic is also used in making cements and varnishes.

**MATE.** See Ilex.

**MATICO** (U. S. P.).—**Matico.**

**Dose,** gr. xxx–ʒj.

*Preparations.*

*Extractum Matico Fluidum* (U. S. P.).—Fluid Extract of Matico. *Dose,* ♏xx–fʒij.

*Tinctura Matico* (U. S. P.).—Tincture of Matico. *Dose,* fʒj–f℥j.

*Extractum Matico.*—Extract of Matico. *Dose,* gr. ii–xij.

**Pharmacology.**—The leaves of Piper angustifolium (Piperaceæ), of South America, contain volatile oil (1½ per cent.), a soft, green, pungent **resin,** a bitter principle termed maticin, **Artanthic acid,** and **tannin.** The odor is aromatic and the taste astringent.

**Therapy.**—Powdered matico acts as a mechanical hæmostatic, the roughness of the leaves favoring clotting of the blood. Internally the fluid extract is used in inflammations and catarrhal affections of the urinary organs, as chronic cystitis, leucorrhœa, incontinence of urine, and menorrhagia. In hæmorrhages from the stomach, bowels, and kidneys, and even from the lungs, it has also been employed, as well as in diarrhœa and dysentery. The use of matico sometimes produces erythema.

**MATRICARIA** (U. S. P.).—**German Chamomile.**

**Dose,** fʒi–iij, in infusion or fluid extract.

**Pharmacology.**—The flower-heads of Matricaria chamomilla (Compositæ) are official under this name. It is a European annual, bearing small, yellow flowers, with white ray-florets; receptacle conical, naked, and hollow. The odor of the plant is due to a blue volatile oil existing in the flower-heads, together with bitter extractive, tannin, etc.

**Physiological Action and Therapy.**—A decoction, drunk as hot as possible, is a remedy for colds as a diaphoretic; in large doses it acts as an emetic. The cold infusion can be used in smaller quantities as a tonic and stomachic. It is highly prized among the common people in Germany for its wonderful virtues, and in a form of sectarian practice which arose in that country toward the close of the last century "chamomilla" occupied a prominent place, in company with such agents as charcoal, silica, and milk-sugar,—all administered in infinitesimal doses.

**MAYS.—Maize, Indian Corn.**

**Pharmacology and Therapy.**—The maize, Zea Mays (Gramineæ), is a cereal of North America, largely cultivated for food. The fruit, or Indian corn, Maidis fructus, contains starch 65 per cent., nitrogenized substances 8 to 10 per cent., with a yellow, fixed oil, sugar, cellulose, and water. Green corn, boiled, is a highly-prized summer vegetable. There are many varieties, but the principal ones are yellow corn and white corn. When ground they afford corn-meal (Maidis farina). Corn-meal is also used for food, as bread, cakes, etc., and, with boiling water, makes a mush, or "hasty pudding." The hot, boiled mush also makes a good poultice, as it retains heat well. Corn-starch (Maidis amylum), made from the ripe corn in the same manner as wheat-starch is prepared, is also an acceptable article of food, used for making puddings, blanc mange, etc. It is in the form of a white, impalpable powder, which can be utilized as a substitute for lycopodium, as a dusting-powder for pills and troches, and for excoriated surfaces, or as a baby-powder.

**MEL** (U. S. P.).—**Honey.**

*Preparations.*

*Mel Despumatum* (U. S. P.).—Clarified Honey.

*Mel Rosæ* (U. S. P.).—Honey of Rose.

*Confectio Rosæ* (U. S. P.).—Confection of Rose (red rose 8, sugar 64, clarified honey 12, stronger rose-water 16 parts).

**Pharmacology.**—Honey is a saccharine secretion deposited in the honey-comb by the honey-bee, Apis mellifica (class, Insecta; order, Hymenoptera). Virgin honey is that obtained from recent combs by incision and straining; when heat is used to separate the comb the product is of a darker color, and there is a loss in flavor. What is known as clarified honey is prepared by heating honey on a water-bath, removing the frothy scum which rises, and straining. The flavor of honey is dependent upon the time of the season and the character of the flowers that furnish the saccharine material. It is believed that, at times, poisonous principles have been taken by bees from narcotic plants, and, consequently, the character of the honey has been affected injuriously. The constituents of honey are fruit-sugar, which remains always liquid, and glucose, which tends to crystallize and thicken the honey. Much of the honey used for household purposes has glucose fraudulently added, or it may be entirely an imitation honey.

**Physiological Action.**—Honey is slightly laxative, and a pleasant, sweet article of food. It is a good excipient for pill-masses.

**Therapy.**—The old mixture of borax and honey for babies' sore mouth is now rarely used, as the honey favors fermentation, and, besides, adds nothing therapeutically to the mixture, for the borax acts better without it. In glycosuria, the use of honey greatly increases the quantity of sugar voided, and it has been used, therefore, to aid in the diagnosis of diabetes. In sore throat, mel rosæ may be used as an application, in combination with astringents. A spoonful of honey made into a paste with an equal quantity of rye meal and thickly spread upon the inflamed surface is claimed by Ziem to be a good application to parauricular abscesses.

**MELISSA** (U. S. P.).—**Melissa, Balm.**

**Pharmacology.**—The leaves and tops of Melissa officinalis (Labiatæ), a small herb growing in Europe and in the United States. It contains gum, tannin, bitter extractive, and volatile oil. The odor of the plant is fragrant, and it has an aromatic, slightly bitter taste; the bruised leaves have a lemon-like odor.

**Physiological Action and Therapy.**—Melissa is carminative, and may be used in infusion, medicated water (distilled), or fluid extract, the dose of the latter being 1 to 2 fluidrachms. The compound spirit of melissa, or Carmelite spirit, is a cordial containing a number of spices, which make it stomachic and corrective of flatulence.

**MENISPERMUM** (U. S. P.).—**Menispermum, Canadian Moon-Seed.** **Dose,** gr. v–xx, in infusion or fluid extract.

**Pharmacology.**—The rhizome and roots of Menispermum Canadense (Menispermaceæ), a vine or climbing plant of the eastern part of the United States, bearing greenish-yellow flowers in clusters, and kidney-shaped fruit, from which it derives its name. The rhizome may be several feet in length; it contains **Berberine,** also an unnamed white alkaloid, soluble in alcohol and ether, sparingly soluble in water.

**Therapy.**—Moon-seed, or yellow parilla, is believed to resemble sarsaparilla in possessing diuretic, tonic, and alterative powers, and is also a laxative. In domestic practice it is used to purify the blood in scrofulous affections, etc.

**MENTHA.—Mint.**

**MENTHA PIPERITA** (U. S. P.).—**Peppermint.**
The leaves and tops of Mentha piperita (Labiatæ).

*Preparations of Peppermint.*

*Aqua Menthæ Piperitæ* (U. S. P.).—Peppermint-Water. *Dose,* fʒj–f℥ij.
*Oleum Menthæ Piperitæ* (U. S. P.).—Oil of Peppermint. *Dose,* ♏i–v.
*Spiritus Menthæ Piperitæ* (U. S. P.).—Spirit of Peppermint. *Dose,* ♏x–fʒj.
*Trochisci Menthæ Piperitæ* (U. S. P.).—Troches of Peppermint. *Dose,* one or more.
*Menthol* (U. S. P.).—Peppermint-Camphor (a crystiline solid). *Dose,* gr. i–v.
Also entering into compound pills of rhubarb and aromatic wine.

**MENTHA VIRIDIS** (U. S. P.).—**Spearmint.**
The leaves and tops of Mentha viridis (Labiatæ).

*Preparations of Spearmint.*

*Aqua Menthæ Viridis* (U. S. P.).—Spearmint-Water. *Dose,* fʒj–f℥ij.
*Oleum Menthæ Viridis* (U. S. P.).—Oil of Spearmint. *Dose,* ♏ii–v.
*Spiritus Menthæ Viridis* (U. S. P.).—Spirit of Spearmint. *Dose,* ♏–vx.

**Pharmacology.**—The leaves and tops of both the Mentha piperita and the Mentha viridis, of the natural order Labiatæ, are indigenous to Great Britain, but are naturalized in the United States and many other countries. Each variety owes its properties to a volatile oil, from 1 to 1¼ per cent. being present with some tannin in peppermint. Menthol, which is the stearopten or camphor of peppermint-oil, is deposited, on cooling, from the oil of the fresh herb of Mentha arvensis and Mentha piperita. It smells and tastes like peppermint, is soluble in alcohol, ether, and the fixed and volatile oils, but slightly soluble in water. Menthol occurs in the form of colorless crystals or fused crystalline masses, and resembles Epsom salts in appearance. It is quite volatile and melts at 108° to 110° F.

**Physiological Action.**—Peppermint, especially the oil, locally has an anodyne, anæsthetic, and antiseptic action. Its taste is rather pleasant and pungent, and it acts as a carminative and stimulant in the stomach, especially in the form of the spirit; the troches are also used for this purpose as well as to disguise a bad breath. Spearmint corresponds, in its effects, with peppermint, but is less powerful and less agreeable.

The taste of menthol is sharp and penetrating. When placed upon the skin it gives rise at first to a burning sensation, which is succeeded by one of coolness, and finally by numbness. It has decided antiseptic power, being comparable in this respect to thymol.

**Therapy.**—In neuralgia, oil of peppermint may be painted over the painful spot or along the course of the nerve. If the oil is employed, evaporation should be prevented by covering the painted surface with oiled silk. It may also be used for myalgia and many local pains, commonly called rheumatic, and is often of service in chronic gout. In flatulent colic, the spirit of peppermint in hot water is a good household remedy, particularly applicable to children. The oil of peppermint allays nausea, and is serviceable in disguising the taste of unpalatable drugs. Peppermint is a good addition to purgative remedies, as in the compound rhubarb pill, to prevent griping. In pruritus pudendi, peppermint-water is a good application, with a drachm or two of borax to each pint.

In a number of cases of pulmonary tuberculosis improvement has followed the inhalation of oil of peppermint, vaporized by means of hot water. Cough, fever and night-sweats entirely vanished.

**Menthol** has been employed almost exclusively as a topical remedy, though it has been given internally in the dose of 5 grains for the relief of neuralgia. It is also recommended as an intestinal antiseptic in the dose of 1½ grain, given in a capsule with oil of sweet almond, six to eight being taken daily.

Its principal usefulness is in the alleviation of itching and pain. It may be applied in the form of a solid pencil or cone, an alcoholic solution, or an ointment. It has also been administered by inhalation in hay fever and diphtheria. In the nasal form of hay fever a mixture of menthol and ammonium carbonate makes a very efficient smelling-salt. In neuralgia (especially when it involves a superficial nerve), in herpes zoster, and dermatalgia, a lotion or ointment containing menthol is capable of affording considerable relief. The pain of a carious tooth may be lessened or removed by placing a menthol solution within the cavity, or menthol dissolved in 15 parts of oil of cloves. The itching of paræsthesia, eczema and urticaria may often be alleviated by the same remedy.

By spraying with a benzoinal solution of menthol Dr. Elizabeth N. Bradley was able to reduce an acute hæmorrhoidal prolapse which came on during a severe attack of epidemic influenza and which had resisted the action of other remedies. The use of the spray was almost immediately followed by cessation of pain and diminution in the size of the tumors.

Inhalations of menthol have also been successfully resorted to in asthma. It is readily volatilized in a teapot by the addition of hot water. The teapot being closed, the vapor is inhaled as it issues from the spout. Ointments and lotions of menthol may be compounded as follows:—

| | |
|---|---|
| ℞ Acidi carbol., | ʒss. |
| Menthol., | gr. xx. |
| Ungt. aquæ rosæ, | ℥j.—M. |

M. Sig.: For paræsthesia, urticaria, and herpes zoster.

| | | |
|---|---|---|
| ℞ Tinct. belladonnæ fol, | | |
| Tinct. aconiti, | āā | fʒiss. |
| Menthol., | | ʒss. |
| Sp. vini rect., | | f℥ij. |
| Glycerini, | | |
| Aquæ rosæ, | āā | f℥ss. |

M. Sig.: Use as a local application in dermatalgia, herpes zoster, and neuralgia.

Dr. Leonard A. Dessar publishes the following formula for an antiseptic snuff-powder:—

| | | |
|---|---|---|
| ℞ Menthol., | | 10 parts. |
| Acid. tannic., | | 2 " |
| Acid. boric., | | 30 " |
| Bismuth. subnit., | | 20 " |
| Amyli, | | 50 " |
| Cocainæ, | | |
| Aristol., | āā | 0.5 part. |

M. Sig.: Make a fine powder.

Dr. Wolf (*Therap. Monatsheft*, September, 1890) recommends menthol rubbed up with sugar (5 to 10 per cent.) applied with a large camel's-hairbrush, as a local disinfectant in diphtheria, used early in the disease. He advises applications to be made several times in the day, removing as much as possible of the membrane at a time. Kastorsky prefers a 10-per-cent. alcoholic solution applied thrice daily by means of a piece of cotton-wool. The same method is beneficial in the sore throat of scarlatina and in catarrhal pharyngitis. A 10- to 50-per-cent. ethereal solution of menthol, applied two or three times a day by means of a camel's-hair pencil, is of service in aborting cutaneous abscesses, boils, carbuncles, etc. In laryngeal and tracheal phthisis, and in the laryngeal ulcerations occurring during the course of pulmonary tuberculosis, Rosenberg uses a 20-per cent. solution of menthol in olive-oil, introduced with a syringe or a spray into the larynx; two or three injections of 15 minims each are made at the affected spot, followed by inhalations of the same from boiling water, or a respirator can be used. The relief from dyspnœa is very great. The secretions grow less, and the ulcers cicatrize and general improvement is noted. Corresponding results have been obtained in pulmonary tuberculosis by the daily application through the trachea in doses of a drachm of a 12-per-cent. solution of menthol in sterilized olive-oil.

In bronchiectasis the injection twice daily of a fluidrachm of the following mixture, as recommended by Dr. T. G. Stewart, was followed by speedy improvement:—

| | |
|---|---|
| ℞ Menthol, | 10 parts. |
| Guaiacol, | 2 " |
| Olive-oil, | 88 " |

M.

Dr. A. L. Benedict, of Buffalo, states that in a number of cases of atonic dyspepsia he has derived advantage from the application of the menthol spray to the walls of the stomach through the stomach tube. The organ is first washed out and a 1- to 5-per-cent. solution of menthol in liquid petrolatum is blown through the tube. The vapor should have an alternate ingress and egress.

In affections of the middle ear, especially when the mucous membrane is much swollen, Dr. Joseph Bronner has derived benefit from inflating the cavity with menthol vapor. A few drops of a 20-per-cent. solution of menthol in olive-oil, contained in an antiseptic capsule attached to the Eustachian catheter, are slowly vaporized and inflated by Lucæ's modification of the Politzer bag. It is important that the use of the vapor should be prolonged and the procedure is said to excite no pain or inflammation. Dr. Cholewa, of Berlin, states that menthol will usually arrest the course of furuncle and suppuration of the ear. It controls diffuse inflammations of the auditory canal and has occasioned marked improvement in cases where the mastoid was involved and in which it seemed that operative procedures would be demanded. He made use of a 10- to 15-per-cent. oily solution.

Menthol has been given with some success in the nausea of pregnancy, dissolved in oil of bitter almond in the proportion of about 12 grains to the drachm and 6 to 10 drops of the mixture administered at a dose dropped upon sugar.

## METHYL CHLORIDE.—Chlormethyl, Monochlormethane.

**Pharmacology and Therapy.**—Methyl chloride is a gas produced by the reaction between methyl alcohol and hydrochloric acid in the presence of zinc chloride. It is free from color and possesses an ethereal odor, is soluble in water, alcohol, ether and chloroform. It becomes liquid under the pressure of five atmospheres at ordinary temperatures. A spray of the liquid directed from the distance of about half a yard from the affected surfaces produces a freezing effect. The application acts as an anodyne and is beneficial in various forms of neuralgia, chronic rheumatism and other painful conditions. Hyperæmia and vesication follow the use of the spray, but may be prevented, it is said, by a previous inunction with glycerin or vaseline.

## METHYL-VIOLET.—Pyoktanin.

**Pharmacology.**—Pyoktanin (pus-destroyer) is a descriptive name applied to methyl-violet, an aniline dye which occurs in the form of a paste and in crystals.

Methyl-violet is known also as methyl-blue and is considered to be, as regards chemical composition, a mixture of methyl pararosanilines in various proportions.

It was brought forward by Prof. J. Stilling, of Strasburg, who stated his belief that it was able to penetrate tissues and act upon deeply-imbedded pathogenetic micro-organisms. That the dye is absorbed by microphytes is shown by the fact that they are rapidly stained, and absorption is said to produce their death, or, at least, suspension of their energies.

Pyoktanin is devoid of odor, is but slightly irritant, and gives rise to no symptoms of systemic intoxication. It has been employed in the form of powder, pencil or solution. The paste can be readily moulded into pencils. The powder is made by mixing 2 parts of methyl-violet or pyoktanin with 100 parts of talc or other inert material. The solution may be made of any strength from 1 part in 100 to 1 in 2000. It is also used in the form of an ointment containing from 2 to 10 per cent. The same title is given to another variety, yellow aniline, chemically pure and free from arsenic. The blue is the stronger agent.

**Physiological Action.**—Methyl-violet is an efficient germicide. According to the laboratory experiments of Fessler, the micro-organisms of pus are destroyed in fifteen minutes by exposure to a 1-to-1000 solution of pyoktanin. This conclusion, however, is contradicted by Trojé, who found that, although the development of germs was inhibited by pyoktanin, yet even after subjection to its action for twelve hours the pus-germs were not certainly destroyed. The latter writer, therefore, asserts that pyoktanin is less powerful than carbolic acid or mercuric chloride. Pyoktanin does not coagulate albumin. A solution of this substance dropped into the eye is said to cause dilation of the pupil without paralysis of accommodation.

Methyl-blue, when administered internally, is rapidly absorbed and soon makes its appearance in the urine, giving a blue color to that fluid. The urine of patients who have taken 3 grains two or three times a day will remain aseptic for three weeks. This dose may cause intermission of the pulse. Pyoktanin is irritant to the kidney and is capable of exciting an acute nephritis. Combemale found that a dose of methyl-blue equal to about 2 grains to the pound of body-weight was fatal to guinea-pigs. The blood exhibited a chocolate discoloration, the heart was flaccid, the liver and mesenteric vessels were engorged.

**Therapy.**—Pyoktanin has been employed almost exclusively as a topical medicament, though Ehrlich and Leppmann state that given hypodermically it relieves neuralgia and rheumatic pains. The diluted powder, the solution, and the pencil of pyoktanin, from the writer's experience, disinfect suppurating or ulcerated wounds, stimulate reparative action in chronic ulcers, and form excellent applications to chancroids, open buboes, and gummous ulcers, to boils and carbuncles.

Unna uses as a dressing to chancroids a mixture composed of:—

| | | |
|---|---|---|
| ℞ Methyl-blue, | | |
| Potass. bicarb., | āā | gr. xv. |
| Distilled water, | | f℥ iij. |
| Alcohol, | | fʒ v. |
| Reduce by heat to three ounces and add | | |
| Methyl-blue, | | |
| Sodii borat., | āā | gr. xv. |
| Distilled water, | | f℥ iij. |
| M. | | |

Good results have been reported in gonorrhœa from the injection of weak solutions. In some cases of chronic cystitis, the injection of a 1-to-1000 or a 1-to-500 solution has been found markedly beneficial.

As a dusting-powder, it has been used upon moist eczema. Stilling, in his original paper, laid great stress upon the value of this agent in affections of the eye, especially corneal ulcers, parenchymatous keratitis, and serous iritis. These assertions have not been generally confirmed. In the experience of most ophthalmologists, pyoktanin is by no means superior, if even equal, to corrosive sublimate. It is conceded, however, that pyoktanin acts as a mild, local anæsthetic.

In conjunctivitis, dacryocystitis, etc, pyoktanin is best employed in the form of a solution. In chronic ophthalmia, trachoma and fistulous openings into the lachrymal sac, the pencils of the drug are preferable to use.

Cheatham* reports good results from the use of methyl-violet or pyoktanin in affections of the eye, ear, nose, and throat. Milder conjunctival diseases yielded readily to solutions of pyoktanin, and trachoma was markedly improved by the same remedy. Gould† states that the effects of pyoktanin in dacryocystitis and lachrymal conjunctivitis have been in his experience extraordinarily good. The same observer writes that excellent results follow the application of pyoktanin in unhealthy orbital cavities after enucleation. It likewise acts well in a certain class of corneal opacities, serving to clarify the tissues and increase visual acuity. Galezowski has used a solution of pyoktanin with excellent effect in cases of herpetic ulcers of the cornea. The vesicles and hyperæmia rapidly disappeared and eventually there was left but a slight opacity which did not interfere with vision. Tiffany likewise reports good results from methyl-violet in eye diseases; particularly marginal blepharitis, or tinea tarsi, ½-per-cent. pomade made with this drug and carefully worked into the roots of the lashes brings about a speedy cure.

Some observers, on the other hand, report in eye diseases bad or negative results from the employment of methyl-violet. Bayer,‡ for instance, states that after its use in forty-six cases of scrofulous pannus, various types of corneal ulcer, dacryocystitis, parenchymatous keratitis, iritis, and sympathetic iridocyclitis, he came to the conclusion that the excellent qualities attributed by Stilling to this aniline dye did not exist in fact; and, moreover, in addition to disagreeable discolorations, may occasion harmful results from their application.

In eye diseases, Braunschweig also found pyoktanin to cause great damage; Kölliker observed no benefit from it, and Mauthner considers pyoktanin useless.

The great difference in the results thus reported from the use of pyoktanin is explained by the observation made by Liebreich (*Therap. Monatshefte*, July, 1890), namely, that pyoktanin, or methyl-violet, is a mixture of aniline products of uncertain composition.

In otology,§ likewise, testimony as to its value is conflicting. While in some cases its use was attended with excellent results in purulent inflammation of the middle ear, furuncle of the external meatus, or after removal of a polypus from the meatus, in other cases of otitis pyoktanin proved a failure.

A persistent case of ptyalism was cured by Heitmann by the local application twice daily to the whole of the oral cavity of a 0.1-per-cent. solution of pyoktanin.

Professor von Mosetig, of Vienna, has reported some encouraging results from the injection of a solution of pyoktanin into the substance and in the neighborhood of sarcomatous tumors unamenable to operation. He made use of solutions of the strength of 1 : 500, afterward increased to 1 : 300, each time employing 1½ drachms. Antiseptic precautions were obseved. No pain or fever was occasioned. The only local symptom was hyperæmia. In a number of instances notable retrocession occurred.* The experience of Professor von Mosetig has been both confirmed and denied by other observers. Of twenty-five cases of malignant neoplasms treated by this method in the clinic of Professor Severano, of Bucharest, and reported by Dr. Nanu, ten were claimed to be cured. When bone was involved no good effect was produced. In several instances it was demonstrated that the parts most deeply stained by the injected fluid had undergone necrobiosis. Dr. Nanu concluded that pyoktanin is able to cure some malignant tumors and that it probably acted by causing thrombosis. Dr. Weir, on the contrary, reports negative results, stating that this substance has been largely employed in the New York hospitals and found valueless in the treatment of carcinoma.

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* "Pyoktanin in Diseases of the Eye, Ear, and Throat," by W. Cheatham, M.D. *The Cincinnati Lancet and Clinic*, November 15, 1890.

† "Pyoktanin in Diseases of the Eye," by George M. Gould, M.D. *University Medical Magazine*, December, 1890.

‡ "Pyoktanin in Diseases of the Eye," *Medical News*, December 6, 1890.

§ See paper on "Experiences with Pyoktanin in Ophthalmological and Otological Practice," by Adolf Alt, M.D., *St. Louis Courier of Medicine*, January, 1891.

The drug has also seemed sometimes to occasion improvement when internally administered in the same class of cases. Dr. Maibaum has thus employed it in the clinic of Professor Wassliew, of Dorpat, giving it in pill or suppository in the dose of 1 grain three times daily, either alone or associated with $\frac{1}{6}$ grain of extract of belladonna.

Pyoktanin has been employed with good results in diphtheria, by Dr. C. Höring. He applies a 3-per-cent. solution two or three times a day to the affected parts, and finds it destructive to the false membranes. It diminishes pain and fever without giving rise to toxic symptoms. Dr. Höring states that he has in this manner treated 112 undoubted cases of diphtheria, 110 of which recovered. In nasal diphtheria he introduced within the cavity and kept in position a tampon saturated in the solution.

Methyl-blue has been used as an internal remedy with asserted advantage in acute gonorrhœa, acute and chronic Bright's disease, herpes zoster and senile paræsthesia. The doses employed in these cases generally ranged from ½ to 3½ grains three times a day. In acute nephritis it is said to quickly quadruple the quantity of urine passed and cause the disappearance of casts, œdema, cardiac and pulmonary symptoms.

Solutions of pyoktanin have been injected into pulmonary cavities with the result of reducing temperature and causing the bacilli to disappear from the sputum. A report in reference to the treatment of tuberculosis by this method has been made by Petterutti and Mirto. These writers state that injections of a 1 : 500 solution of pyoktanin directly into a cavity are well borne, produce no reaction, reduce temperature and cause disappearance of bacilli from the sputum. The remedy has a deleterious effect upon the bronchi if brought in contact with the mucous membranes, and may also exert an injurious influence upon the kidney.

The absence of odor is one feature which makes this substance preferable to iodoform. On the other hand, methyl-violet communicates a deep-purple color to the skin or linen with which it comes in contact. This stain may be removed, however, by dilute hydrochloric or nitric acid, alcohol, or cologne-water.

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* See *Medical Bulletin*, April, 1891.

**METHYLAL.—Methylene-dimethyl-ether.**

**Dose,** fʒi–ij.

**Pharmacology and Therapy.**—Methylal is obtained by acting upon methylic alcohol by a mixture of sulphuric acid and manganese dioxide. It is a colorless fluid, boils at 107.6° F., and is soluble in water, alcohol, ether, fatty and ethereal oils. Methylal reduces arterial pressure and has a hypnotic effect. It is rapidly eliminated. It has been used in insomnia, but a tolerance is soon established and the remedy loses its influence unless given in constantly increasing doses. Methylal has been given with some success in asthma and intestinal colic. Methylal has also been employed in order to allay the excitement of delirium tremens. For the purpose of producing local anæsthesia in dentistry methylal has been mixed with 4 parts of tincture of coca. One part by weight of methylal and 6 parts of almond-oil has been recommended as a liniment.

**METHYLENE BICHLORIDE.**

**Pharmacology and Therapy.**—Methylene bichloride is a colorless fluid having an odor resembling that of chloroform. It is prepared by reducing an alcoholic solution of chloroform by zinc and hydrochloric acid. The agent was introduced by Sir Benjamin Ward Richardson as an anæsthetic, but has not been extensively used for that purpose and is not free from danger. The fluid used under that name seems, in fact, to have been of variable composition and probably its virtues depend upon the presence of chloroform. Richardson has also used it as an internal remedy in doses of 5 to 30 minims and states that it possesses antiseptic, stimulant, antispasmodic and anodyne properties. He praises its action in typhoid fever combined with hydrogen dioxide and in acute rheumatism associated with sodium salicylate.

**METHYLENE BLUE.—Tetramethylthionine Chloride.**

**Dose,** gr. ii–v.

**Pharmacology and Physiological Action.**—Methylene blue communicates a blue color to the urine and fæces. Large doses will sometimes cause a scalding sensation in the bladder. It has an inhibitory influence upon various microbes. P. Ehrlich observed that the plasmodium of malaria and the red blood-corpuscles are strongly influenced by this dye. According to the observation of Rosin it arrests the movements of the malarial parasites.

As the methylene blue usually sold as a dye contains zinc chloride it is important that, for therapeutical experiments, a chemically pure article should be obtained.

**Therapy.**—Solutions of methylene blue have been locally applied with advantage in vaginitis and to fistulous tracts.

Methylene blue has been found of service in malarial fevers by Guttmann, Ehrlich, Thayer, and others, though whether it is able to prevent recurrence has not yet been demonstrated. It was administered five times daily in doses of 1½ grains, the interval between the doses being dependent upon the form of the attack. It is recommended that the remedy be continued in the same doses for at least eight or ten days after cessation of the fever. Methylene blue has a rapid influence upon the chills and fever, causes disappearance of the plasmodia from the blood and decrease in the size of the spleen. It has been beneficially given by hypodermic injection. Its tastelessness may commend it for use in juvenile patients. Although it has a decided action in malarial fever it cannot be regarded as possessing any special advantage over quinine. In certain cases of malaria M. Laveran was unable to observe any effect upon the duration of the paroxysm or the number of hæmatazoa from the administration of methylene blue in daily doses of 4½ to 6 grains. Professor G. Mya, in fact, concludes that the antimalarial action of this substance is uncertain and inconstant and that the plasmodia disappear but slowly under its influence.

Methylene blue has been serviceable, also, in trigeminal neuralgia, migraine, herpes zoster, and muscular rheumatism. In neuralgia it may be given in the daily amount of 15 grains without producing any ill effects.

Netschajeff, of Moscow, has derived good results from the use of this remedy in acute nephritis. He administered 1½ grains thrice on alternate days. The quantity of urine was increased, albumin and casts were diminished and œdema rapidly vanished. Methylene blue is of service in diphtheria, being administered internally and applied topically in watery 1-to-9 solution. Clinical experiments have been made with methylene blue in the treatment of tuberculosis. It reduces the temperature and in most cases diminishes night-sweats. It may serve a good purpose in the early stage of the disease, but in advanced cases has no effect upon cough, expectoration or diarrhœa. Professor d'Ambrosio, of Naples, observed a remarkable improvement in a case of ulcerated mammary carcinoma from daily injections into the tumor of 15 minims of a 1-per-cent. solution. Pain and hæmorrhage ceased and the tumor underwent retrocession. A. Darier, of Paris, has cured superficial epitheliomata by painting them with a solution containing 15 grains of methylene blue dissolved in 1¼ drachms each of alcohol and glycerin. All of the portion stained is then touched with a steel probe which has been dipped in a 1-to-5 solution of chromic acid. Crusts should be removed before the application is made. The internal exhibition of methylene blue in gonorrhœa seemed to produce a decided effect upon the discharge. It has also been used with asserted advantage in this disease as an injection, a 1-to-200 or 1-to-250 solution being used from ten to fifteen times a day. D'Aulnay reports good results from packing the vagina with a tampon saturated in a solution composed of 2½ drachms of methylene blue, ½ ounce of alcohol and 3 grains of potassium in 7 ounces of water.

It has been proposed to take advantage of the green color which this substance communicates to the urine by adding it to medicines given to hypochondriacs and malingerers.

Excellent results in eleven cases of beri-beri from the use of methylene blue are reported by Professor Thur. The internal administration of the remedy is also apparently of some service in carcinoma.

**METHYSTICUM.** See Kava-Kava.

### MEZEREUM (U. S. P.).—Mezereon.

**Dose,** gr. x.

*Preparations.*

*Extractum Mezerei.*—Extract of Mezereon. Used only as an irritant.

*Extractum Mezerei Fluidum* (U. S. P.).—Fluid Extract of Mezereon. Used only as an irritant.

*Unguentum Mezerei.*—Ointment of Mezereon (contains fluid extract of mezereon 25, lard 80, yellow wax 12 parts; the alcohol of the extract being entirely evaporated by heat).

**Pharmacology.**—Mezereon is the bark of Daphne mezereum (Thymelaceæ) and of other species of Daphne, growing in Europe and Asia in mountainous regions. It contains **Daphnin,** a bitter glucoside in colorless crystals, sparingly soluble in cold solvents; an acrid, rubefacient, **volatile oil,** and a soft brown, acrid **resin,** which is the anhydride of **Mezereinic acid.** Mezereon is an ingredient in the compound decoction and compound syrup of sarsaparilla, and the extract enters into the compound mustard liniment. (See Sinapis.)

**Physiological Action.**—The powdered bark is irritating to the skin and, when fresh, causes vesication; it excites violent sneezing when inhaled into the nostrils. In small doses internally it is sialagogue, laxative, and diuretic, and is considered tonic and alterative. In large doses, it is a violent, irritant poison, causing vomiting, purging, and inflammation of the stomach and intestines. Nephritis is said to follow its tonic administration. The treatment would be eliminative and symptomatic. Demulcent drinks, starch-water, etc., may be freely swallowed, and hypodermic injections of morphine given. The ointment is used as an irritant to keep up discharges from ulcers and blistered surfaces.

**Therapy.**—The use of mezereon in medicine is restricted to its external application in the form of an irritant ointment, as first mentioned, and its combination with sarsaparilla and other remedies in the forms above referred to, as an alterative in syphilis and chronic rheumatism, associated with potassium iodide.

℞ Potassii iodidi, . . . . . . . . . . ʒ ij.
Syr. sarsaparillæ co.,
Aquæ, . . . . . . . . . . . āā f℥ iij.

M. Sig.: A tablespoonful two hours after meals, for syphilis, rheumatism, and skin diseases.

Mezereon-bark has been successfully used to relieve toothache, and as a masticatory in paralysis of the tongue.

### MITCHELLA.—Squaw-Vine, Checker-Berry, Winter-Clover, Partridge-Berry.

**Dose,** fʒss–j, in infusion or fluid extract.

**Pharmacology.**—The whole plant of Mitchella repens (Rubiaceæ) is used in making the infusion and fluid extract. It is a small, creeping, evergreen herb, with red berries appearing in the Autumn, which may remain until spring. The leaves and berries have a flavor like that of gaultheria; the composition is unknown.

**Physiological Action.**—The preparations of Mitchella are said to be astringent, diuretic, and parturifacient; they are also supposed to favor the occurrence of menstruation.

**Therapy.**—In dropsy and suspension of urine the infusion is given, and also in dysmenorrhœa, menorrhagia, etc. Its name of "squaw-vine" was gained from its use by the Indians, who administered the infusion to women for several weeks before the expected occurrence of parturition in order to facilitate delivery.

### MONESIA.

**Dose,** gr. x-xx.

**Pharmacology.**—The bark of Chrysophyllum glycyphlæum Casaretti (Sapotacæ), a tree of Brazil, and other varieties of the same species, contains, according to Henry and Payen, saponin, an allied body termed monesin, tannic acid, glycyrrhizin, wax, a crystalline fatty substance, etc.

**Physiological Action and Therapy.**—Monesia possesses expectorant properties free from unpleasant effects, and, by virtue of the tannin which it contains, is astringent. Small doses of monesia improve the appetite. Large amounts disturb the stomach and cause constipation. Formerly employed in medicine, monesia had fallen into disuse, but has been studied anew by Dr. P. G. Rozanoff, of Moscow. It was found of benefit in acute and chronic bronchitis, pneumonia, subacute enteritis, and diarrhœa, given in a mixture of ½ to 1 drachm of aqueous extract of the bark to 6 ounces of water, a tablespoonful dose every second hour. Monesia was particularly valuable in coexistent catarrhal states of the respiratory and intestinal tracts. It is said to possess virtue as a tæniacide. A decoction containing 2 ounces each of monesia and pomegranate bark will usually prove an efficient combination. Monesia has also been given with asserted advantage in dyspepsia, scurvy, scrofula, hæmoptysis and menorrhagia. In the form of powder or ointment it has been applied to indolent or unhealthy ulcers. An extract is given in doses of 2 to 10 grains; it may also be administered in aqueous solution, syrup or tincture. Monesin has been applied to ulcers and has been used internally in the dose of ½ grain. Monesin is said to possess oxytocic virtue.

**MORPHINA** (U. S. P.).—**Morphine, Morphium.** (See Opium.)

### MORRENIA.

**Pharmacology.**—Morrenia brachystephana (Asclepiadaceæ), a plant growing in the Argentine Republic and other South American countries, contains, according to the analyses of Señor Pedro N. Arata, fatty acid, resins, salts of lime, a glucoside, starch, albumin, gum, and a small quantity of a substance giving alkaloidal reactions. The alkaloid was obtained as a dark, reddish mass, of pleasant odor and a very bitter taste, soluble in chloroform, water, and amylic alcohol.

**Therapy.**—The physiological action of the plant has not been studied, but it has long enjoyed a local reputation as a galactagogue, and Del Arca and Sicardo report favorably as regards its efficacy. From the leaves or root an infusion is prepared in the strength of 3 ounces to the pint of water, the dose being a tablespoonful.

**MORRHUÆ OLEUM** (U. S. P.).—**Codliver-Oil.**

**Dose,** fʒi–℥ss.

**Pharmacology.**—A fixed oil, obtained from the fresh liver of Gadus morrhua, or of other species of Gadus (class, Pisces; order, Teleostia; family, Gadida). It is a nearly colorless or straw-colored, thin, oily liquid, consisting chiefly of **Olein** and other fatty principles. The best oil is that containing the largest proportion of olein, which congeals at a lower temperature than the oils of inferior quality. It also contains a peculiar principle named **Gaduin,** with **Trimethylamine,** and traces of iodine, bromine, phosphoric and sulphuric acids, and biliary salts. Good oil should be pale in color; should not have a strong, fishy smell or taste; should not deposit much granular fat at 32° F., and should, when treated with sulphuric acid, give a violet color-reaction, changing to brownish red. If 1 drop of the oil be dissolved in 20 drops of carbon disulphide, and the solution shaken with 1 drop of sulphuric acid, it will acquire a violet-blue tint, rapidly changing to rose-red and brownish yellow. With nitric acid the oil yields a purple color, changing to brown. The investigations of Gautier and Mourgues in 1888, into the composition of codliver-oil, showed its complex character; they claimed to have found several new alkaloids, butylamine, amylamine, oxylamine, dihydrobutylamine, oxycollidine, nicomorrhuine, dihydrolutidine, aselline, and morrhuine, besides an unstable, fatty substance, morrhuic acid, containing phosphorus and resembling lecithine of nerve-tissue.

The alkaloids exist principally in the light-colored oil and result from an auto-digestion of the livers at the end of three or four days of maceration.

From the study of sections of the fresh liver of the cod by J. Bouillot, however, it would appear that the alkaloids found in codliver-oil exist in the hepatic tissue normally, as he detected crystals of the alkaloids by the use of the microscope.

These alkaloids—or, at least, some of them—are now being prepared for medicinal use, and the following free bases and salts can be obtained: amyline, with its hydrochlorate, hydrobromate and bitartrate; dihydrolutidine, with its bitartrate; oxycollidine and its hydrochlorate; nicomorrhuine and its hydrochlorate; and morrhuine.

Under the name of **Morrhuol,** M. Chapoteaut has isolated these principles from codliver-oil, in the form of an amber-brown, bitter, aromatic liquid, partially crystallizing at a low temperature, and consisting of the free oleic acid of the oil, alkaloids, and the fatty combinations with sulphur, iodine, bromine, and phosphorous. Thus, morrhuol represents the medicinal value ef codliver-oil in very much reduced bulk. The usual dose of morrhuol is 1 or 2 capsules, each containing 20 centigrammes (about 3 grains) taken with or immediately after meals. Children take 2 to 4 daily and adults 6 to 8 daily. Capsules of morrhuol creosote may also be obtained (each containing 3 grains of morrhuol and 1 minim of pure beechwood creosote).

**Physiological Action.**—Externally, codliver-oil acts as a bland oil without causing irritation, and is even instilled into the eye by oculists. Its fishy smell is an objection to its use by inunction, and yet in infants this is such a valuable method of introducing it into the blood that the objection is overlooked. Applied to the surface in fevers, it reduces bodily temperature. Internally, in doses suited to the powers of assimilation, it increases the appetite and improves nutrition, enhances the number of red blood-corpuscles, stimulates healthy cell formation, and exerts an alterative effect. Morrhuol, not being fatty (to the same extent, at least), does not directly increase the bodily weight, but otherwise act physiologically in the same manner as the oil. According to Gautier and Mourgues, many of the alkaloids of codliver-oil, as butylamine, amylamine, and especially morrhuine, together with morrhuic acid, stimulate the nervous system, promote tissue change, cause a rapid increase of the urine and perspiration, and, proportionately, sharpen the appetite. In addition, the phosphorus exists in organic combination capable of being readily appropriated by young cells. The association of fatty bodies with biliary matter promotes absorption and assimilation. The properties of the iodine and bromine are also enhanced by the state of organic combination in which they exist.*

Bouillot has extended to the human subject the experiments made by Gautier and Mourgues upon animals. His researches confirmed those of the latter observers. The urea was greatly increased as well as the quantity of the urine. Analyses furthermore demonstrated that the augmentation of urea was due to a more complete oxidation of nitrogenous matter.

Erythema or acne is sometimes due to the internal use of codliver-oil.

**Therapy.**—In children suffering with marasmus, scrofula, chronic skin affections, tuberculosis, and wasting diseases generally, the use of codliver-oil by inunction daily, or several times a week, produces rapid improvement. The patient is stripped and the oil applied over the surface of the body, with the manipulations of massage, before a warm fire; a blanket is wrapped around him, which is to be kept on for an hour or two; the excess of oil is then removed by a warm bath containing a little whisky or bay-rum. In this way the child does not have such a disagreeable odor as when the oil is simply applied under its binder. In the cœliac affection of children, characterized by suspension of function of the pancreas, this method is particularly applicable, and is absolutely necessary in order to keep up nutrition. In cases of whooping-cough similar inunctions to the chest are very serviceable. These inunctions are likewise valuable in the case of children exhausted by chronic diarrhœa, and of adults who suffer with chronic dysentery and scaly skin diseases. The daily inunction of codliver-oil is of some service in reducing the susceptibility to taking cold. The local application of this agent is useful in chronic rheumatism and rheumatoid arthritis. The internal administration or external use of codliver-oil is advisable in rachitis and laryngismus stridulus. As an internal remedy it is sometimes effective in habitual constipation in children. This oil has been used with advantage in diabetes mellitus characterized by great debility, and is especially indicated if it is associated with pulmonary phthisis.

Codliver-oil is used internally as a nutrient as well as a medicine. Its value is most marked in chronic disorders attended by malnutrition, in phthisis, chronic pulmonary processes, rheumatic affections, rheumatoid arthritis, and atheroma. It is also very useful in nervous affections, chorea, neuralgia and epilepsy, in syphilitic and strumous cachexia, and various eruptions upon the skin due to them. In convalescence from many diseases, codliver-oil is an easily-assimilated form of nourishment. Chronic gout is ameliorated by the administration of codliver-oil. In chronic bronchitis it is of service, facilitating expectoration and promoting the nutrition of the diseased membrane. It is also a valuable remedy in emphysema. Codliver-oil is indicated in caries or necrosis of bone due to tuberculosis. In neurasthenia it may be given with advantage. The exhibition of this remedy is of especial utility in many cases of convalescence from measles or scarlatina. In pannus and chronic conjunctival affections, codliver-oil has been instilled into the eye with good results.

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* *Annales de Thérapeutique Médico-Chirurgicales*, March, 1890.

Bouillot found that the administration of the alkaloids of codliver-oil was of decided benefit in the treatment of amenorrhœic and neurasthenic girls, feebly nourished children, and old persons suffering from chronic bronchitis. They were well borne by those who were unable to take the oil.

**Special Forms.**—There can be no question that the digestibility of the oil is increased by mechanical and chemical conditions, as when given in the form of a good emulsion (not a soap, but a minute subdivision of fat-globules in a mucilaginous medium, resembling milk), and by the addition of pancreatin, and also by association with certain restorative agents, like the hypophosphites or calcium lacto-phosphate. The immense demand for these emulsions, stimulated by judicious advertising, has led to a very large production and much competition among manufacturing pharmacists to supply the requirements of the physician and patient. In manufacturing on a large scale, cost is carefully estimated, and the result in many cases is that an inferior grade of oil is used. It would be better for physicians to order an extemporaneous emulsion made with the best oil by responsible pharmacists, or instruct patients how to make it (white of egg, pancreatin, oil, and, if desired, a little whisky or Jamaica rum, stirred with an egg-beater or simply shaken together in a bottle, make a very acceptable preparation). A serviceable emulsion for children is made by rubbing together codliver-oil and extract of malt (or maltine), equal parts. Gubb maintains that codliver-oil forms a solution with aqueous extract of malt, and that this combination is the most efficient means of disguising the taste of the oil. If there are fishy eructations, liquid pancrobilin may be given with the oil, or liquor pancreaticus, which will emulsify the oil and favor its absorption.

A 50-per-cent. emulsion may readily be made by rubbing together 8 parts of the oil with 3 parts each of condensed milk, glycerin or syrup, and 2 parts of water. A few drops of oil of bitter almond or wintergreen render the mixture more palatable. A codliver-oil jelly may be prepared by soaking 5 ounces of gelatin in 30 ounces of water for a few hours, heating until dissolved, adding 30 ounces of syrup, and finally 60 ounces of codliver-oil, to which some flavoring oil has been added. The mixture should be stirred well and poured into wide-mouthed bottles or jars.

The following emulsions, containing codliver-oil, will be found to be serviceable:—

℞ Olei morrhuæ,
Glycerini,
Syrup. hypophosphitum, . . . . . . . āā f℥ iv.
Olei cinnamomi, . . . . . . . . . . . ♏x.
M. et ft. emul. mist.
Sig.: A tablespoonful three times a day. Valuable for tuberculosis, debility, and chronic skin diseases, such as eczema, psoriasis, acne, and seborrhœa.

℞ Olei morrhuæ, . . . . . . . . . . . f℥ viij.
Liquor. pancreatini, . . . . . . . . . f℥ ij.
Pulveris myristicæ, . . . . . . . . . ʒ iij.
M. et ft. emul. mist.
Sig.: A tablespoonful just before meals. Use in debility and weak digestion.

℞ Olei morrhuæ,
Liquor. calcis, . . . . . . . . . . āā f℥ v.
Olei gaultheriæ, . . . . . . . . . . . ♏x.
M. et ft. emul. mist.
Sig.: A dessertspoonful three times a day. Serviceable in scrofula, tuberculosis, and in chronic skin diseases.

℞ Olei morrhuæ,
Syrup. pruni Virg.,
Ext. malti, . . . . . . . . . . . āā f℥ iv.
M. et ft. emul. mist.
Sig.: A tablespoonful three times a day. Employ in debility, in diseases of the throat, and in chronic bronchitis and tuberculosis.

℞ Olei morrhuæ,
Spiritus vini gallici,
Syrup. hypophosphitum cum ferro, . . . . . āā f℥ iv.
Ol. menth. pip., . . . . . . . . . . . ♏x
M. et ft. emul. mist.
Sig.: A tablespoonful three times a day. For syphilis, scrofula, and chronic diseases.

℞ Olei morrhuæ, . . . . . . . . . . . f℥ iv.
Olei eucalypti,
Creosoti, . . . . . . . . . . . . āā ♏x.
Spiritus ætheris comp., . . . . . . . . . f℥ j.
M. et ft. emul. mist.
Sig.: Two teaspoonfuls three times a day. Beneficial in tuberculosis and chronic tuberculosis.

The preliminary administration of an ethereal preparation, like Hoffman's anodyne or pure ether, in cold water will favor the digestion of the oil by stimulating the flow of the pancreatic fluid. An addition of 1 per cent. oil of eucalyptus is said to make it more acceptable to the palate. It is a good plan to eat a slice of lemon after taking the plain oil, in order to remove the oily taste from the mouth. A piece of pickle before and after taking the oil is stated to produce the same effect. Numerous other methods have been suggested in order to conceal the taste of codliver-oil and aid its assimilation. Alcohol in some form is frequently used for this purpose. Washing the mouth out with brandy or whisky will partially obtund the sense of taste, so that a dose of oil may be quickly swallowed without exciting much sensation. The oil may be poured into the froth of beer in such a manner as not to touch the edge of the glass, or it may be taken in a hot punch. A few drops of chloroform will, it is said, disguise the taste. A little salt, taken just before and after the oil, has been recommended. Some prefer to take it in black coffee. It is stated that tomato catsup covers the taste of codliver-oil, and that chewing smoked herring, or a sardine, accomplishes the same purpose. Others administer it in milk or in lime-water, to which a drop or two of some essential oil has been added. A formula given by Seig may effectually disguise the taste, while the odor of the mixture resembles that of roasted meat:—

| | |
|---|---|
| ℞ Olei morrhuæ, | f℥lxx. |
| Creosoti, | ♏xl. |
| Saccharin., | gr. iiss.—M. |

The following combination is recommended by Eisenschitz for the purpose of disguising the taste of the oil:—

| | |
|---|---|
| ℞ Olei morrhuæ, | f℥iij. |
| Saccharin., | gr. iv. |
| Æther. acetic., | fʒss. |

M. Instead of the acetic ether, 2 drops of essence of peppermint or 1 or 2 drops of essence of cinnamon may be used.

Some patients prefer to take the oil before meals, and find the eructations do not occur, as when taken after eating. The mistake is generally made of giving it in doses larger than can be digested, with the result of disordering the stomach and even exciting diarrhœa. A ferrated codliver-oil is made by dissolving 10 parts of iron benzoate in 1000 parts of the oil, with the aid of gentle heat and frequent agitation. It is a clear, reddish-brown liquid. The oleate of quinine may be combined with it in any desired quantity.

An arsenical codliver-oil is prepared by warming 0.5 gramme (7½ grains) of arsenous oxide with 20 grammes (5 drachms) of absolute alcohol in a small flask; the addition of a small particle of potassium carbonate causes solution of the oxide without itself undergoing any change. The solution being filtered is added to 1500 grammes (nearly 3 pints) of codliver-oil and warmed on a water-bath until the alcohol is dissipated. The oil is perfectly transparent and the preparation can be administered to children in doses of ½ to 1 teaspoonful.

**Lipanin** is an artificial mixture, intended as a substitute for codliver-oil. It was devised by von Mering, and consists of 6 parts of oleic acid to each 100 of olive-oil. It is free from disagreeable odor and taste, and is readily emulsified and easily digested; it may be given with calcium and sodium hypophosphites (gr. x of each) several times a day. Galatti* finds lipanin palatable and well borne by children; under its use they increase in weight and appetite, but the tuberculous process does not seem to be influenced by it. It costs more than codliver-oil.

Von Mering has also prepared a mixture known as tonic chocolate, which consists of chocolate to which oleic acid has been added, and may be used to take the place of codliver-oil.

Another proposed substitute for codliver-oil and which has the merit of palatability is known as linonine. This preparation consists of linseed oil, together with ferric hypophosphite, oil of eucalyptus, oil of gaultheria, Irish moss, marshmallow, glycerin and diluted hydrocyanic acid.

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* Annual of the Universal Medical Sciences, 1890, vol. v, p. A-88.

**MOSCHUS** (U. S. P.).—**Musk.**
**Dose,** gr. v–viij.

*Preparation.*

*Tinctura Moschi* (U. S. P.).—Tincture of Musk (5 per cent.). *Dose,* f℥ ss–j.

**Pharmacology.**—Musk is the dried secretion from the preputial follicles of Moschus moschiferus (class, Mammalia; order, Ruminantia) or musk-deer. The musk-sac is, in the living male animal, situated between the navel and the genitals, but nearer the latter, between the skin and the muscles of the abdomen. Musk in pods, or musk in the unopened sacs, is the only kind to be used in medicine, each sac containing from 60 to 130 grains of actual musk. It is imported from China. Genuine Tonquin musk is composed of roundish grains of irregular size, dark reddish-brown, of a peculiar, penetrating, persistent odor and a bitter taste. It is partly soluble in water, and less so in strong alcohol; dilute alcohol dissolves about one-half. The odorous principle is probably a product of decomposition, constantly being formed; complete drying destroys it, but it returns again after moisture has been added. It is also destroyed by hydrocyanic acid and by camphor. Musk contains ammonia, fat, cholesterin, resinous matter, fatty acids, etc. It is largely used in perfumery, being very lasting and holding more evanescent perfumes with it. Musk in grains is much adulterated, or spurious. An artificial musk* has been produced, but quinine sulphate has the property of destroying its odor, while genuine musk is in no way affected by it.

**Physiological Action.**—Musk is a diffusible stimulant and antispasmodic. It creates a sensation of heat in the stomach, and in some persons excites nausea and vomiting. Headache and giddiness are also produced, with stimulation of the sexual appetite. A primary excitement of the central nervous system is succeeded by a more or less marked soporific effect. According to Brunton, musk appears to stimulate the respiratory centre. Artificial musk is reported to have little or no physiological or therapeutical effect, even when used subcutaneously.

Some cases having been reported of death from symptoms of malignant œdema after the subcutaneous injection of tincture of musk, Dr. J. Van Cott, Jr., examined various tinctures as well as the musk-sac itself for the presence of the bacilli of the disease. No bacilli were found in the tinctures, but in two cases infusions of the sacs yielded the organism which presumably had been attached to the skin removed with the sac.

**Therapy.**—Musk has been used in collapse of typhoid and other low fevers. Musk is valuable in the pneumonia of drunkards and in other cases of this disease occurring in debilitated subjects; also in hiccough, delirium tremens, and in convulsions of children. In many of the manifestations of hysteria—emotional crises, palpitation of the heart, vomiting, or spasm—this remedy is of value. The same may be said regarding other spasmodic affections, as chorea, whooping-cough, and laryngismus stridulus. It has been considered beneficial in melancholia and irregular gout. Its high price and the difficulty of obtaining an unadulterated article take it out of the ordinary range of remedies.

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* "Artificial Musk," *Pacific Record*, December 15, 1889.

**MUCUNA.—Mucuna, Cowhage.**

**Pharmacology and Therapy.**—The hairs scraped from the pods of Mucuna pruriens (Leguminosæ), of the East and West Indies, were formerly used as a vermifuge, a drachm or two being mixed with molasses and administered to children suffering with round worms. It causes irritation, stimulating an erythematous or urticarial eruption when brought in contact with the skin. It is said that dishonest horse-dealers use cowhage to make horses appear more spirited, by applying it to anus, or genitals, just before exhibiting the animal for sale.

**MUSCARINA.—Muscarine.** See Agaricus Muscarius.

**MYRCIÆ OLEUM** (U. S. P.).—**Oil of Myrcia, Oil of Bay.**

*Preparation.*

*Spiritus Myrciæ* (U. S. P.).—Spirit of Myrcia (bay-rum). External use.

**Pharmacology and Therapy.**—The oil of myrcia is distilled from the leaves of Myrcia acris (Myrtaceæ), or bay-tree, of the West India Islands. It contains **Eugenic acid** and a hydrocarbon. It is used only as a perfume. The spirit, or bay-rum, is an agreeable cooling application in fevers, headache, etc.

**MYRICA.—Myrica, Bayberry-Bark.**

**Dose,** gr. xx–xxx.

**Pharmacology.**—The Myrica cerifera (Myricaceæ), a native of North America, contains in its bark a volatile oil and acrid resin.

**Physiological Action.—Myrica** is stimulant and astringent.

**Therapy.**—Externally, the infusion or diluted fluid extract of Myrica may be used as a gargle or injection in various affections of the mucous membranes. It has also been employed in dysentery and diarrhœa.

**MYRISTICA** (U. S. P.).—**Nutmeg.**

**Dose,** gr. v–xx.

*Preparations.*

*Oleum Myristicæ* (U. S. P.).—Oil of Nutmeg. *Dose,* ♏i–v.
*Spiritus Myristicæ* (U. S. P.).—Spirit of Nutmeg. *Dose,* fʒi–ij.
*Pulvis Aromaticus* (U. S. P.).—Aromatic Powder (cinnamon 35, ginger 35, cardamom and nutmeg each 15 parts). *Dose,* gr. v–ʒj.

**Pharmacology.**—The nutmeg is the seed of Myristica fragrans (Myristicaceæ) deprived of its testa. The outer covering or arillode of the fruit is official under the name of **Macis**, or mace. The tree is a native of the East Indies, but grows also in the West Indies and in South America. The kernels of the seeds are round or elliptical in shape, about an inch in greater diameter and ¾ inch in smaller diameter. They are rather dense and heavy, and contain 2 to 8 per cent. of a volatile oil (which is official), and from 25 to 30 per cent. of fixed oil, usually known as oil of mace, with some resin. Nutmeg is fragrant, spicy, and somewhat bitter. It is useful in flavoring, and enters into a number of pharmaceutical preparations: aromatic spirit of ammonia, aromatic tincture of rhubarb, aromatic powder, compound tincture of lavender, troches of chalk, of magnesia, and of sodium bicarbonate, and also is a constituent in vinegar of opium.

**Physiological Action.**—With aromatic and carminative qualities, nutmeg unites considerable narcotic power, and in overdoses produces stupor and delirium. Dr. John Gillespie has reported a case* where five powdered nutmegs, taken to procure an abortion, had produced frontal headache, vertigo, free perspiration and urination, narcosis, and collapse. The treatment was an emetic of zinc sulphate (gr. xxx), followed by small, repeated doses of aromatic spirit of ammonia. A similar case has been reported by Waugh.

**Therapy.**—The volatile oil of nutmeg is rubefacient, and may be used in rheumatism, neuralgia, and paralysis.

Nutmeg has been employed with advantage in itching and painful hæmorrhoids, according to the following formula:—

℞ Pulv. myristicæ, . . . . . . . . . . ʒij.
Acid. tannic., . . . . . . . . . . ℈j.
Petrolati, . . . . . . . . . . ℥j.
M.

Internally, the powdered or grated nutmeg is employed as a carminative, anodyne and astringent, to relieve sick stomach and for diarrhœa; it also allays colalgia and intestinal spasm. Garretson employs nutmeg for diarrhœa combined as follows:—

℞ Pulveris myristicæ,
Bismuth. subnit., . . . . . . . . . āā ℥ss.
Cretæ præparatæ, . . . . . . . . . . gr. lxxx.
Syrup. zingiberis, . . . . . . . . . . f℥iij.
M. Sig.: From a teaspoonful to a dessertspoonful every two hours.

Small doses favor digestion by stimulating the secretion of gastric juice. Nutmeg may be used to disguise the taste of unpalatable mixtures and to prevent the griping of a cathartic medicine.

The narcotic properties of nutmeg render it of avail in the treatment of delirium tremens. Mace acts similarly, but is used as a spice or condiment more than as a medicine. The expressed oil of nutmeg may be combined with wax and olive-oil, with heat, as ordered in the German Pharmacopœia, to form the myristicæ ceratum used as a warming application to the abdomen of babies suffering with colic or indigestion.

## MYRRHA (U. S. P.).—Myrrh.

**Dose,** gr. ii–xxx.

### *Preparations.*

*Tinctura Myrrhæ* (U. S. P.).—Tincture of Myrrh (20 per cent.). *Dose,* fʒss–ij.

*Tinctura Aloës et Myrrhæ* (U. S. P.).—Tincture of Aloes and Myrrh (of each 10 per cent.). *Dose,* fʒi–iv.

*Pilulæ Aloës et Myrrhæ* (U. S. P.).—Pills of Aloes and Myrrh. *Dose,* one to three.

*Tinctura Myrrhæ et Capsici.*—Tincture of Myrrh and of Capsicum, "Hot Drops" or "No. 6" (myrrh 6, capsicum 3, alcohol 100 parts). *Dose,* fʒss–j.

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* *Philadelphia Medical Times,* vol. xvii, page 726.

**Pharmacology.**—Myrrh is a gum-resin obtained from Commiphora myrrha (Burseraceæ). It contains 60 per cent. of gum, 35 per cent. of **Myrrhin,** a resin, and about 2 per cent. of myrrhol, an ethereal oil; also some bitter principle. It forms an emulsion when rubbed up with water, which dissolves about 60 per cent. With alcohol it is partly soluble, forming a brownish-yellow tincture. Myrrh enters into several preparations besides those mentioned above, as the compound iron mixture, compound iron pills, compound galbanum pills, and compound rhubarb pills.

**Physiological Action.**—Myrrh is slightly astringent and stimulant locally, and internally is carminative in small doses, but large ones cause vomiting and purging. It has some expectorant qualities, and is a stimulant to the ovarian and uterine functions.

**Therapy.**—Diffused in water, with the addition of a little carbolic acid or thymol, tincture of myrrh is a good mouth-wash for spongy gums, sore throat, or wounds after operations upon the mouth, or ptyalism occurring after the use of mercury. It may be applied in the full strength to ulcerated gums, aphthous patches, relaxed uvula, and freckles. It is also used in dentifrices and to correct bad breath. A lotion or ointment containing myrrh is a stimulant and antiseptic dressing to indolent or unhealthy ulcers. An ointment made by heating together myrrh with wax and oils has been found useful in those cases of eczema which require moderate stimulation.

Favorable reports have been made of its action in atonic dyspepsia and gastralgia, though it has usually been prescribed in combination with other remedies. In amenorrhœa, it is often given in conjunction with iron. Internally, myrrh is considered valuable in checking excessive discharges, bronchorrhœa, leucorrhœa, cystitis, etc. Under the name of myrrholin a concentrated solution of 1 part of myrrh in 1 part of oil has been given in tuberculosis conjoined with creosote in capsules. Myrrh has been used with reported success in diphtheria. It is given internally and applied locally to the pharynx. In laryngeal diphtheria the patient is made to inhale every hour or half hour from 2 to 4 drachms of a 2-per-cent. mixture of myrrh.

### MYRTOL.

**Dose,** gr. iv.

**Pharmacology.**—The Myrtus communis (Myrtaceæ) is a beautiful evergreen shrub or small tree, a native of the countries surrounding the Mediterranean. Its leaves and berries contain a volatile oil. According to E. Jahns, the myrtle-oil of Spanish origin contains various terpenes, cineol, and a camphor-like body, and the myrtol of commerce should more appropriately be termed rectified myrtle-oil.

Myrtol is that portion of the oil of myrtle distilling between 160° and 170° C. (320° to 338° F).

**Physiological Action.**—Myrtol is disinfectant and antiseptic. It causes no irritation when applied to the sound skin. Upon an abraded surface it gives rise to a slight burning sensation, which, however, soon disappears, and a 9-per-cent. emulsion of myrtol completely arrests the growth of the micro-organisms of pus. The decomposition of organic material is prevented by myrtol. Taken internally its promotes digestion. Large doses occasion nausea and headache. It is removed from the system by the lungs and kidneys, and communicates a violet-like odor to the breath and urine.

**Therapy.**—Externally, myrtol has been used with success as a disinfectant to surfaces covered with unhealthy, or decomposing pus. It has proved efficacious in cutaneous diseases of vegetable parasitic origin, and has been recommended as a local remedy in psoriasis. Given internally, it has been found destructive to lumbricoid and thread worms. Eichhorst advises its use in chronic bronchitis attended with profuse and fetid muco-purulent expectoration. The sputum becomes less abundant, less purulent, and less offensive. It diminishes fœtor in gangrene of the lung. In pulmonary tuberculosis it is said to decrease the number of bacilli. This remedy has also given relief in chronic pyelitis and cystitis, and has proved useful in passive hæmorrhage. Mrytol was introduced to the notice of the profession in 1878 by Dr. Linarix.*

The extract of myrtle has been used by Dr. R. Weil, of Berlin, with reported benefit in diabetes mellitus. It was administered in doses of 2 grains thrice daily, increased every three days by three pills until fifteen were taken in the day. The remedy was well borne and caused diminution in the quantity of the sugar.

Myrtol has been administered hypodermically, the solution used being 1 part of myrtol to 4 parts of liquid paraffine or oil of sweet almonds.

## NAPHTHALINUM (U. S. P.).—Naphthalin, Coal-Tar Camphor.

**Dose,** gr. i–x.

**Pharmacology.**—Naphthalin is a benzine derivative, separated from coal-tar by distillation, occurring in the form of white crystals, which may be compressed into cakes like camphor, and having a peculiar odor. It was discovered by Garden in 1820. Naphthalin is insoluble in water, but soluble in alcohol, ether, and chloroform. Being destructive to insect life, it is employed as a substitute for camphor in preventing the invasion of moths.

**Physiological Action.**—Naphthalin may be prescribed internally as an intestinal antiseptic in doses of gr. ii–x (or to children, gr. i–iij) every three or four hours. It may be given with white sugar in capsules or wafers. It has also decided expectorant powers, although its insolubility only permits a small quantity to be absorbed, which is discharged as naphthol or phenol by the bronchial mucous membrane or the urinary passages, thus acting as a local disinfectant at the point of excretion. It is devoid of local irritant properties. The urine assumes a dark color under its use. A morbilliform eruption, followed by desquamation, has been observed after the administration of naphthalin.

**Therapy.**—Naphthalin is a useful antiseptic in treating ulcers, cancers, and pus-cavities; it can be used in watery emulsion, in alcoholic solution, or in a dry form. An alcoholic solution is used as an application to sprains and bruises.

In addition to the affections named, a naphthalin ointment is advantageously applied to chancres, chancroids, syphilitic ulcers, sloughing wounds, chronic eczema, and psoriasis. This ointment may contain 30 grains or more to the ounce of basis :—

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* De l'Emploi du Myrtol ou l'Essence de Myrte principalement dans les Maladies des Voies Respiratoires et Genito-Urinaires.

| | |
|---|---|
| ℞ Hydrarg. chloridi mitis, | gr. x. |
| Naphthalini, | ʒj. |
| Ungt. camphoræ, | ʒ vij. |

M. For chancroids, ulcers, and chronic eczema.

As a topical application in diphtheria Kuznecow advises :—

| | |
|---|---|
| ℞ Mentholi, | ʒj. |
| Alcohol. q. s. ad solv. et adde : | |
| Liq. naphthalini, | fʒj. |
| Ol. terebinth., | fʒij. |
| Glycerini, | fʒij. |

M.

In intestinal disorders due to infection, *e. g.*, typhoid fever, diarrhœa, and possibly in cholera, naphthalin is of eminent usefulness in diminishing the activity of the bacteria of the intestinal canal, as shown by C. Sehrwald, who also advises the use of calomel in conjunction with naphthalin in order to increase the bactericidal effect.

Naphthalin is said to diminish glycosuria when the patient is upon a mixed diet. For dysentery Rossback advises the injection into the rectum of 10 grains of naphthalin in decoction of marshmallow at a temperature of 100° F. Naphthalin has also been administered internally in the treatment of this disease with good results.

It has also been found efficacious in the treatment of ascarides and tænia. For children a mixture has been recommended of the following composition :—

| | |
|---|---|
| ℞ Naphthalin, | gr ivss–viij. |
| Ol. ricini, | ℥ss. |
| Ess. bergamottæ, | gtt. ij. |

For tænia adults may take 15 grains of naphthalin before eating, to be followed immediately by a dose of castor-oil. A single dose will expel the worm entire even when other remedies have failed.

Chavernac maintains that the vaporization of naphthalin in the room exerts a beneficial influence upon whooping-cough. Scales of this substance, dusted into the shoes and stockings, are said to be of service in hyperidrosis.

## NAPHTHOL, ALPHA and BETA.

**Dose,** gr. ss–v.

**Pharmacology.**—Alpha- and beta-naphthols are obtained by heating together for several hours naphthalin and sulphuric acid. A large quantity of hot water being then added to the mixture, the excess of naphthalin is filtered off and the solution saturated with lead carbonate. From these lead-naphthaline sulphonates the respective acids are prepared, and from the acids fused with an alkali two naphthols are made,—the alpha and beta. Beta-naphthol is the first to crystallize, and is readily separated from the alpha variety by boiling alcohol, in which the latter is insoluble.

A simple test for distinguishing between alpha- and beta-naphthol is given by M. Aymonier. A few drops of a mixture consisting of 15 grains potassium bichromate, 15 minims of pure nitric acid and 2½ drachms of distilled water will at once produce with alpha-naphthol a black precipitate, while beta-naphthol is unchangedby the reagent.

Pure alpha-naphthol is perfectly white, melts at 122° C. (241.6° F.), and boils at 286° C. (546.8° F.). Genois shows that when alpha-naphthol is treated with ferric chloride the solution turns green, and white di-naphthol is precipitated. Alpha-naphthol is insoluble in cold and slightly soluble in hot water. It is very soluble in ether and alcohol, from either of which it crystallizes in white, shining needles. Alpha-naphthol has an aromatic odor and somewhat pungent taste, and is converted, with heat and hydrochloric acid, into naphthalin and sulphuric acid. Genois states that impure alpha-naphthol is dangerous and quite unfit for medicinal use.

**Physiological Action.**—Alpha-naphthol, used internally, produces warmth in the stomach, stimulates the glands of the entire gastro-intestinal tract, and tends to make the fæcal discharges of rather a soft consistency. Large doses have caused increase in the arterial tension and symptoms of cerebral hyperæmia. The systemic action of alpha-naphthol differs but little from that observed from the administration of beta-naphthol. Alpha-naphthol has marked antiseptic properties. Maximovitsch reports (*Merck's Bulletin*) that alpha-naphthol, in the proportion of 1 to 10,000 of culture-gelatin, prevents the growth of the most various pathogenic microbes; even in the proportion of 0.6 or 0.8 to 10,000 it retards the development of microbes by three to eight days. Sternberg has demonstrated that both naphthols restrain the growth of the comma bacillus according to the strength in which they are used. Maximovitsch further adds that similar antiseptic effects were produced by beta-naphthol, but twice as much, he reports, had to be used to produce the same results. Alpha-naphthol has a stimulating and astringent action upon the skin.

**Therapy.**—Alpha-naphthol, from the writer's experience, is certainly a good antiseptic. It is also a useful disinfectant. Alpha-naphthol solution, from 1 to 30 grains to the ounce of distilled or boiled water, is serviceable in treating wounds or ulcers, and for all surgical procedures requiring an antiseptic agent. Alpha-naphthol solutions are beneficial in seborrhœa, acne, rosacea, chronic eczema, and alopecia. Nasal catarrh, buccal inflammations, pharyngitis, and laryngitis, are often relieved or removed by the application of alpha-naphthol solutions. The solution can, in the diseases just named, be used with advantage in the form of a spray. Solutions of alpha-naphthol can be employed with advantage in injections for gonorrhœa in both sexes, in gleet, in leucorrhœa, and in irritation and inflammation of the lower portion of the rectum. Alpha-naphthol incorporated in some fatty substance (gr. v to lx to the ounce), as lard, suet, butter, lanolin, zinc or lead ointment, can be used for very many diseases of the skin, such as chronic acne, rosacea, psoriasis, chronic eczema, alopecia circumscripta, and for chronic ulcers. According to the author's experience, alpha-naphthol, while a good stimulating and astringent substance, having also antiseptic properties, lacks, to a great extent, the anæsthetic or sedative effects upon the integument which belong to beta-naphthol. Further, the internal use of alpha-naphthol has not been followed, in the writer's experience, with that decided action observed from beta-naphthol. Alpha-naphthol can, however, be employed internally in from $\frac{1}{2}$ to 5 grains, three or four times a day, for chronic catarrh of the stomach or bowels, and in constipation. It can also be used as an antiseptic in smaller doses ($\frac{1}{4}$ to 10 grains three or four times a day) in typhoid and other fevers.

Maximovitsch recommends, when tympanites and abdominal pains are excessive in typhoid fever, the following combinations :—

| | |
|---|---|
| ℞ Alpha-naphthol., | gr. viij. |
| Bismuth. subnitrat., | gr. ivss. |
| Pulv. rhei, | gr. iij. |
| Extr. belladonna. folior. alc., | gr. $\frac{1}{6}$. |

M. Sig.: Four to six such powders daily.

Or,

| | |
|---|---|
| ℞ Alpha-naphthol., | gr. viij. |
| Codein., | gr. $\frac{1}{6}$. |
| Pulv. rhei, | gr. iss. |
| Cinnamom. zeylan., | gr. iij. |

M. Sig.: Four to six such powders during the day.

In dysentery the same writer reports good results from :—

| | |
|---|---|
| ℞ Alpha-naphthol., | gr. xv–ʒj. |
| Ol. ricini, | f℥iij. |

M. Sig.: Several spoonfuls daily according to the age of the patient.

**NAPHTHOL, BETA.**—(U. S. P.)

**Dose,** gr. ss–v.

**Pharmacology.**—Beta-naphthol occurs as colorless scales, or as a white, crystalline powder, melts at 253.4° F., is soluble in 75 parts of boiling water, and is freely soluble in alcohol, ether, chloroform and fixed oils. M. Charrin (*Le Bulletin Médical*) states that a saturated solution of boric acid in water increases the solubility of beta-naphthol. Beta-naphthol has a pungent taste, but is free from odor. Naphthol and salicylic acid have been combined and used under the name of salinaphthol.* It is odorless, tasteless, and insoluble in water.

Both the naphthols and naphthalin can be readily tested by the distinctive color changes which take place when melted in a test-tube with chloral hydrate, adding to the chloral solution a few drops of hydrochloric acid and finally placing a small piece of zinc in the acidulated solution.

**Physiological Action.**—When taken internally naphthol gives rise to a sensation of warmth in the stomach. The fæces are softened and clay-colored. Diarrhœa is occasionally produced. Large doses sometimes cause vertigo, buzzing in the ears, and symptoms of cerebral hyperæmia. Beta-naphthol is slightly stimulant to the skin and mucous membranes, allays pain and pruritus. It is one of the most powerful antiseptic agents, possessing three times the strength of carbolic acid or iodoform and four times that of creosote or naphthalin. It may be regarded as absolutely safe, since, according to Professor Bouchard's investigations, nearly half a pound would be required to cause death in a healthy person weighing 150 pounds.

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* *Therapeutic Gazette*, January 15, 1891.

On the contrary, cases of nephritis have been attributed to the influence of beta-naphthol. Dr. Max Baatz has recently reported two cases, one of which proved fatal, in which this result was attributed to the use of an ointment containing naphthol. Both patients were children.

Kobert believes that by the action of the pancreatic juice and the intestinal ferments, naphthol with salicylic acid, or sali-naphthol, is split up into salicylic acid in the urine. Lepine,* on the contrary stated that the intestinal juice is incapable of producing this decomposition, but added that it may be brought about by the pancreatic secretion. The decomposition of sali-naphthol he reports may be due simply to an alkaline reaction.

**Therapy.**—Beta-naphthol is a valuable local remedy in parasitic diseases of the skin. An ointment containing $\frac{1}{2}$ drachm to the ounce is destructive to pediculi and their ova. The same preparation is equally fatal to the itch-mite, and at the same time relieves the inflammation occasioned by the parasite. It soothes the irritation produced by the bites of fleas, bed-bugs, and mosquitoes. The various forms of tinea trichophytina yield to the influence of naphthol ointment. A 10-per-cent. ointment of beta-naphthol has been employed with advantage in cases of favus.

The itching of paræsthesia, urticaria, pemphigus, and prurigo is very successfully treated in the same manner. Beta-naphthol is especially valuable when the skin is rough and infiltrated. In chronic eczema and psoriasis it is a reliable medicament. The secretions of the skin are favorably influenced, and it very often proves useful in the treatment of hyperidrosis and bromidrosis. Benefit also results from the employment of this substance in acne, seborrhœa, sycosis, alopecia circumscripta, lupus erythematosus and vulgaris, chronic ulcers, chancres, and chancroids. The remedy may be used in the form of a powder, lotion, or ointment. It is often well combined with bismuth or other mild powder, as—

| | |
|---|---|
| ℞ Naphthol. beta, | gr. xv. |
| Bismuthi subnitratis, | ℥j. |

M. For use as a dusting-powder.

The odor of cancer and ozæna is overcome by naphthol. It is an excellent antiseptic dressing to wounds, and may often be advantageously employed, according to the method of Professor Reverdin, by impregnating previously sterilized gauze bandages with an ethereal solution. An aqueous solution may be used with good result in mercurial salivation and chronic pharyngitis. Vaginitis, vulvitis, gonorrhœa, and gleet are notably improved by the use of naphthol. For gonnorhœa and gleet an injection may be composed as follows:—

| | |
|---|---|
| ℞ Naphthol. beta, | gr. v. |
| Glycerini, | f℥j. |
| Aquæ, | f℥iij.—M. |

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* *Journal de Médecine de Paris*, November 16, 1890.

A solution of beta-naphthol in glycerin and water is useful in chronic otorrhœa. Beta-naphthol has been employed in diseases of the ear, the results being satisfactory in the majority of cases, though in a few the effects were apparently injurious. The powder was generally blown directly upon the diseased parts. At other times it was employed in the form of a 1½- to 3-per-cent. alcoholic solution, allowing it to remain from two to five minutes. The more profuse the suppuration the more frequently should the procedure be repeated.

An aqueous solution of the strength of 1 to 2500 has yielded good results in purulent ophthalmia. In simple or granular conjunctivitis and trachoma, likewise, this agent has proved a valuable remedy. This substance is very advantageously combined with camphor. Camphorated naphthol is formed by adding 1 part of naphthol to 2 parts of camphor, and is a colorless, syrupy liquid, well adapted for use as a local antiseptic. It may be beneficially employed in wounds, ulcers, sinuses, diphtheria, tubercular laryngitis, and, rubbed up with lard, it forms a valuable application in many diseases of the skin. M. Reboul has used camphorated naphthol with advantage in irrigation of diseased bones and joints, abscess cavities and tuberculosis of the bladder. He has also obtained good results in tuberculosis of glands from the interstitial injection of 4 or 5 drops of the fluid every eight or ten days. The intra-peritoneal injection of camphorated naphthol has been attended with very encouraging results in tubercular peritonitis in the practice of Dr. Rendu, of Paris. Eruptions have sometimes followed the topical use of camphorated naphthol. Inhalations of beta-naphthol are of service in pharyngitis, chronic nasal catarrh, hay asthma, whooping-cough, and chronic bronchitis.

Beta-naphthol is administered internally chiefly as a means of securing antisepsis. Being almost insoluble, it is one of the best agents at our command for disinfection of the alimentary tract. In typhoid fever it mitigates the severity of the disease and reduces the rate of mortality. The stools are deodorized, tympanites lessened, and the tongue moistened. Grave delirium rarely makes its appearance. These results, announced by Professor Bouchard, have been amply confirmed by the writer and numerous observers at home and abroad. Dr. Mitchell Bruce* concludes that the duration of typhoid fever is shortened, and the tendency to secondary complications overcome, by the use of beta-naphthol. The testimony of Dr. Petresco, of Bucharest, is strongly to the same effect.† The remedy is equally valuable in the typhoid fever of young children. When the diarrhœa is profuse it is advisable to combine naphthol with bismuth salicylate, thus:—

℞ Naphthol. beta,
Bismuth. salicylat., . . . . . . . . āā ʒij.
M et. div. in chart. no. xv.
Sig.: A powder every hour or as required.

Good results are derived from the internal administration of this drug in diphtheria, erysipelas, and scarlatina. In flatulent dyspepsia, chronic gastric, or intestinal catarrh, and dilatation of the stomach, it is no less efficacious. Professor Dujardin-Beaumetz recommends, in dilatation of the stomach, the following combination :—

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* *Practitioner*, December, 1888.

† J. Petresco: "Recherches cliniques et expérimentales sur l'Antisepsie Médicale," January, 1889.

℞ Naphthol. beta,
Bismuth. salicylat.,
Magnes. calcinat., . . . . . . . . . āā gr. cl.
M. et div. in chart. no. xxx.
Sig.: One powder before each of the two principals meals.

In obstinate constipation, connected with disturbed digestion, the author has witnessed excellent results from ½- to 3-grain doses of beta-naphthol given three or four times a day. By some practitioners beta-naphthol is highly esteemed as a vermifuge, particularly useful for the destruction of round worms. Dr. G. A. Gibson, of Edinburgh, has found beta-naphthol, in the dose of 2 grains thrice daily, of decided efficacy in the treatment of simple and pernicious anæmia.

Beta-naphthol is likewise often of utility in chronic cystitis.

Beta-naphthol with salicylic acid (sali-naphthol) is reported to act similarly to salol, without being as toxic, in articular rheumatism, in doses of from 4 to 8 grains.

Beta-naphthol is well given in the form of tablet triturates. Milk, glycerin, and mucilage are also excellent vehicles for its administration.*

**Microcidin.**—Under the name of microcidin, a combination of beta-naphthol with caustic soda has been introduced. Microcidin ocurs in the form of a white powder, the principal constituent of which is sodium naphtholate. Microcidin is soluble in water, alcohol and ether, is said to be superior to carbolic and boric acids in germicidal power, but somewhat inferior to naphthol and mercuric chloride. A weak solution is used upon wounds and ulcers and for the purpose of removing the odor of gangrene. Microcidin has been used with success in diseases of the ear, nose and throat, generally in the proportion of 3 to 5 per 1000.

**Hydro-Naphthol,** as the writer and others have already shown,† exists only as an impure form of beta-naphthol. It is a quasi-proprietary preparation.

**Lacto-naphthol or Lactol.**—M. Coez has prepared a compound analogous to benzo-naphthol. Lacto-naphthol, or lactol, is the lactic ether of naphthol, and is decomposed in the alimentary canal into its components. It is without taste and has been taken without inconvenience in daily doses of 15 grains.

**Asaprol.**—This name is given by MM. Dujardin-Beaumetz and Stackler to one of the derivatives of beta-naphthol, viz., the sulphuric ether of beta-naphthol, in the form of salt of calcium, containing traces of naphthol and calcium sulphate. Asaprol presents itself in the form of a white powder, extremely soluble in water and alcohol. It is incompatible with alkaline iodides, sulphates and most of the alkaline salts. Its antiseptic properties are nearly equivalent to those of sodium salicylate. It allays pain and reduces temperature in different diseases and is of special service in acute inflammatory rheumatism. It may be administered in doses of 60 to 150 grains.

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* See papers by the author, "Naphthol: its Medicinal Use and Value," *Journal of the American Medical Association*, October, 1883; *Therapeutic Gazette*, October 15, 1889.

† See papers by the author, "The Imputations on Beta-Naphthol," and "The Beta-Naphthol *vs.* Hydro-Naphthol Contention," *Journal of the American Medical Association*, July 14, 1888, and May 11, 1889.

Asaprol is rapidly eliminated by the kidneys. Its presence in the urine may be detected by the addition of ferric chloride, which produces a black color tending to blue. Asaprol is comparatively free from toxicity. It does not occasion vertigo or buzzing in the ears. It was tolerated without inconvenience by dyspeptic patients and those suffering from albuminuria. In some cases of influenza Stackler found asaprol efficient in reducing fever and alleviating pain. He obtained good results from its use also in gout, asthma, furunculosis, anthrax, tonsillitis and various infective conditions.

**Iodo-Naphthol.**—A combination of beta-naphthol and iodine, known also as di-iodide of beta-naphthol, a greenish-yellow, tasteless and odorless powder, soluble in chloform, slightly soluble in alcohol, ether and acetic acid, and insoluble in water, has been applied as an antiseptic dusting-powder to wounds and ulcers.

## NECTANDRÆ CORTEX.—Nectandra-Bark, Bebeeru-Bark.

### *Preparation.*

*Beberinæ Sulphas.*—Beberine Sulphate. *Dose,* gr. j–x.

**Pharmacology.**—The bark of Nectandra Rodiæi, a tall tree of British Guiana, contains tannic acid, starch and an alkaloid discovered by Maclagan and called beberine. The alkaloid is said by Flückiger to be identical with buxine, derived from Buxus sempervirens and pelosine from Pareira brava. Pure beberine is a white, amorphous powder, bitter to the taste and devoid of odor, soluble in alcohol and ether, but sparingly soluble in water. Beberine sulphate occurs in the form of thin, dark-brown scales, of bitter taste, soluble in water and alcohol. Another alkaloid, termed sipirine, insoluble in ether, has been separated. Nectandrine, also an alkaloid, is present in the wood.

**Physiological Action and Therapy.**—Beberine sulphate produces tetanic spasms in frogs. In the human subject the bark or alkaloid increases appetite, improves digestion, is somewhat astringent and possesses some antiperiodic power. It is said not to produce headache or ringing in the ears. It may be employed in atonic dyspepsia and conditions of general debility. Bebeeru-bark was introduced as a substitute for quinine. Though often successful in breaking up malarial fever it is far less reliable than cinchona. It has been given with benefit in periodical headache and neuralgia. This remedy has also been employed with asserted advantage in menorrhagia, leucorrhœa and strumous ophthalmia.

## NEROLI OLEUM.—Oil of Neroli, Volatile Oil of Orange-Flowers.

**Pharmacology.**—The oil of neroli is distilled from the flowers of Citrus aurantium and Citrus vulgaris (Aurantiaceæ). Dissolved in alcohol (2 per cent.) it forms the spirit of neroli, used for flavoring. The oil of neroli is obtained in the distillation of orange-flower water, but is not the same volatile oil as that contained in the water (see Aqua Aurantii Florum), and orange-flower water cannot be made from the oil of neroli.

## NICOTINA.—Nicotine.

Nicotine is an alkaloid obtained from tobacco. See Tabacum.

## NITROGLYCERINUM.—Nitro-Glycerin. See Glonoinum.

## NUX VOMICA (U. S. P.).—Nux Vomica, Poison Nut.

*Preparations.*

*Extractum Nucis Vomicæ* (U. S. P.).—Extract of Nux Vomica. *Dose,* gr. $\frac{1}{4}$–$\frac{1}{2}$.
*Extractum Nucis Vomicæ Fluidum* (U. S. P.).—Fluid Extract of Nux Vomica. *Dose,* ♏i–v.
*Tinctura Nucis Vomicæ* (U. S. P.).—Tincture of Nux Vomica. *Dose,* ♏v–xx.
*Strychnina* (U. S. P.).—Strychnine. *Dose,* gr. $\frac{1}{60}$–$\frac{1}{20}$.
*Strychninæ Sulphas* (U. S. P.).—Strychnine Sulphate. *Dose,* gr. $\frac{1}{60}$–$\frac{1}{12}$.

**Pharmacology.**—Nux vomica is the seed of Strychnos nux vomica (Loganiaceæ), of East Indies. The seeds are disk-shaped, about an inch in diameter, covered with silky hairs, of a greenish-gray color, and grayish-white internally; very tough, and difficult to powder. Odor none, but the taste is very bitter. **Strychnine** ($\frac{1}{4}$ to $\frac{3}{5}$ per cent.), and **Brucine** ($\frac{1}{2}$ to 1 per cent.) with **Igasuric acid,** are the important constituents, besides fixed oil, tannin, etc. A third alkaloid, isolated by Desnois, in 1853, and termed **Igasurin,** is crystallizable, bitter to the taste, and shares the poisonous properties of the other alkaloids.

Flückiger has found smaller amounts of strychnine and brucine in the wood, and Hooper detected brucine but not strychnine in the leaves of the strychnos nux vomica.

The powdered drug varies in alkaloidal strength, and in using the fluid preparations it is necessary to have them standardized in order to insure uniformity of physiological and therapeutic effect. Strychnine represents the medicinal activity of nux vomica. Strychnine crystallizes out of alcohol in the form of colorless prisms and dissolves in pure sulphuric acid without change of color. If a few drops of this solution be placed upon a white plate and an equal quantity of potassium-bichromate solution be cautiously brought into contact with its edge, a beautiful and characteristic play of colors is produced, ranging through blue, purple, crimson, and red-brown. This color change is distinctive and is available as a delicate test for strychnine. Morphine obscures this test, and hence, if present, should first be removed by means of an alkaline mixture of chloroform. A physiological test is also utilized in cases of suspected poisoning; $\frac{1}{1000}$ grain of strychnine sulphate in a drop of water, applied to the dried skin of a frog, will produce spasm in about ten minutes. Brucine, which gives rise to a similar physiological reaction, is likewise a crystalline body, soluble in 320 parts of cold or 150 parts of boiling water, has a strongly bitter and persistent taste, and, although generally resembling strychnine in its properties, will sometimes destroy life without the occurrence of convulsions. Strong sulphuric acid strikes a blood-red or scarlet color with brucine and its salts. Igasurine occurs in colorless, silky prisms, is more soluble in water than either of the other alkaloids, has a similar bitter taste and toxic action, is colored rose-red by strong sulphuric acid and a deeper red by nitric acid. It is soluble in water and in alcohol, making intensely bitter preparations, thus rendering the pill form preferable for administration.

**Physiological Action.**—In minute doses, repeated three or four times daily, which is the best way to get its tonic effect, strychnine increases the appetite, stimulates secretion, improves digestion, and exalts the vital powers, improving also sight and hearing. Strychnine is a stimulant to the respiratory centre, also to the heart and vaso-motor centres Arterial pressure is raised and the pulse becomes more slow. The pupil dilates under its influence. Peristalsis is increased and the bowels somewhat loosened; even diarrhœa may result from full doses.

From experiments upon dogs Agricolansky has ascertained that large doses of strychnine suppress the pancreatic secretion. Smaller quantities either produce no effect or slightly stimulate the gland. The presence of a small amount of strychnine in the pancreatic juice seems to promote its amylolytic action. Strychnine stimulates the genito-urinary system, has some influence upon the muscular tissue of the uterus, favors the occurrence of the menses, increases the venereal appetite, and excites erections. Dr. E. Maurel has published some interesting researches regarding the influence of strychnine upon the leucocytes of the blood. From his observations he believes that these cells exhibit, in different animals, a specific sensibility to its action and that in accordance with the susceptibility of the leucocyte is that of the animal. The functions of the spinal cord are exalted as well as stimulated, according to Biernacki,* and especially those of the anterior gray columns, but a very large dose paralyzes and destroys them. The brain is not affected directly until the accumulation of carbonic-acid gas in the blood causes coma and insensibility.

Biernacki states, however, that subcutaneous injection of small doses of strychnine nitrate reduces the electric excitability of the cerebrum.

This drug is absorbed rather slowly by the stomach, more rapidly by the rectum. Its toxic effects are, consequently, more promptly manifested after injection into the rectum than when administered by the mouth. Strychnine is slowly excreted by the kidneys, but elimination is more rapid in children than in old people. Strychnine also escapes in the saliva. It, therefore, tends to accumulate in the system, and produce muscular stiffness, cramps, and other symptoms of toxic action. Dr. Woodley Stocker has observed in his own person and in others, flushing of the face, throbbing of the head, giddiness and faintness caused by doses of strychnine sufficiently large to approach the physiological limit.

On account of its slow rate of absorption and elimination, its exhibition should be occasionally suspended for a time, lest a dangerous quantity should accumulate within the system. Strychnine is a local irritant. It possesses some antiseptic virtue, and, to a certain extent, inhibits the movements of leucocytes, though far feebler in this respect than quinine. A bright red eruption has been observed to follow the administration of a small dose of strychnine in exceptional cases.

**Poisoning by Strychnine.**—When a large dose ($\frac{1}{12}$ to $\frac{1}{2}$) is given to an adult and absorbed, the face is drawn into a grin (risus sardonicus), the lower jaw becomes immovable, the neck rigid, the pupils dilate, the reflexes are heightened so that the muscles contract spasmodically and painfully; then paroxysmal attacks of tonic contraction, especially of the extensor muscles of the body, in which the patient assumes the position of episthotonos, occur; finally, the muscles of respiration become tetanically fixed, and death occurs from apnœa and carbonic-acid accumulation in the blood, producing narcosis. Dr. Perry has reported a case of strychnine poisoning in which, four days after the immediate convulsive effects had ceased, paralysis of the muscles of the upper and lower limbs and of the intercostal muscles occurred. Dyspnœa increased rapidly and the patient died from asphyxia. The kidneys were injected. The fatal result may ensue in a few minutes if the dose be a large one. About ½ grain may be regarded as a minimum fatal dose. It acts more rapidly and effectively when given by the rectum, or hypodermically, than when swallowed. As is the case with other active poisons, the lethal dose varies within considerable limits. Death has resulted from ½ grain of strychnine or 3 grains of extract of nux vomica; on the other hand, as much as 6 grains of strychnine sulphate have been taken without fatal effect. One-third of a grain of strychnine by the mouth, or $\frac{1}{20}$ grain subcutaneously injected, must be considered a dangerous quantity.[*] When a fatal dose has been taken death is not usually long delayed. Recovery is the rule if the patient survives for three hours. Dr. Taylor, in his work on poisons, states that six hours is the longest recorded period for a fatal issue. A case, however, has been described by Dr. Thomas J. Henry, of Warialda, New South Wales, in which death was postponed for nine hours after about 10 grains had been taken, the patient in the interval having been under treatment.

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* *Therap. Monatshefte*, August 1890.

A very instructive case, showing the after-effects which may be caused by strychnine poisoning, has been published by Dr. G. Honigmann, from the clinic of Professor Riegel, of Giessen.[†] A man who suffered from the classical symptoms of this accident had recovered under the liberal use of chloral hydrate. At the expiration of twenty hours after taking the poison, only a minute quantity of urine had been voided. Albumin was unmistakably present. There was abdominal pain with constipation. During the second night a small quantity of clear urine was passed, which contained an abundant precipitate of albumin. It deposited a sediment in which were detected both white and red blood-corpuscles and a few hyaline casts. The pain and constipation continued and the pulse remained slow and strong. On the fourth day albuminuria persisted; the urine was still scanty; the sediment rich in blood-corpuscles, hyaline and epithelial casts, with renal epithelium. The kidneys began to resume their functions upon the fourth and fifth days, after the skin had been roused to free perspiration. The albumin, casts, and cells began to decrease at the same time, but did not finally disappear until the fourteenth day. During all this time the pulse remained very slow. The renal insufficiency and albuminuria were probably due to limitation of the circulation through the kidney by contraction of its vessels. But the composition of the sediment indicated that a more permanent injury had occurred. The reporter plausibly conjectured that the renal epithelium had been affected, giving rise to an acute glomerulo-nephritis.

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[*] "Materia Medica and Therapeutics," by Charles D. F. Phillips, M.D., Phila., 1886, p. 456.

[†] *Deutsche Medicinische Wochenschrift*, May 30, 1889; *Medical Bulletin*, October, 1889.

**Diagnosis of Strychnine Poisoning.**—The convulsions do not resemble those occurring during the epileptic paroxysm, because they are always tonic and never clonic in character. They may be distinguished from those of tetanus by the history of the case and by the symptoms. In tetanus, the muscles of the lower jaw are first attacked; locked-jaw exists for some time before the other muscles are involved; moreover, in tetanus they do not entirely relax; some remain rigid; whereas, in strychnine poisoning, all the muscles are affected almost simultaneously, and then are relaxed until the next paroxysms. In what is known as tetany, the muscles about the neck are usually not affected, but there is persistent rigidity of other muscles. In hysterical convulsions the muscular contractions are not painful, and the patient does not retain full sensation, nor full consciousness, but is in a dreamy or stupid condition. In convulsions of hydrophobia the patient is semi-delirious, there are no tonic spasms of muscles or cramps, and there is a history of wound from an animal.

**Antidotes and Treatment.**—Tannin is the chemical antidote to nux vomica and to strychnine. The antidote should be given immediately, and a convenient form is tea or coffee that has been standing for an hour or more, given grounds or leaves and all, washing out the stomach afterward with warm water or coffee. After spasm has developed, the introduction of the tube may excite convulsions. In order to obviate this occurrence the patient should be placed under the influence of amyl nitrite or chloroform. The same caution applies to catheterism. The physiological antidotes are potassium bromide, chloral, and physostigmine, or Calabar bean. Amyl nitrite, chloroform, or ether inhalations may be cautiously employed at the onset of the paroxysms, and artificial respiration practised. The catheter should be used frequently, and the bowels thoroughly evacuated with croton-oil. The physiological antidotes may be given by the rectum. If relaxation does not occur, amyl nitrite may be injected hypodermically. Animal charcoal and fats are useful adjuvants. Sanquirico prefers paraldehyde to chloral, and warmly recommends intra-venous injections of a considerable quantity of an 8-per-cent. soda solution, which produces active diuresis and elimination. Opium and conium may also be brought into requisition as physiological antidotes. Dr. Whitla* writes with decided approval of tobacco† and alcohol in poisoning from strychnine. He states that he would not hesitate to use alcohol alone in a desperate case, and believes that it will afford the best chance of success in dealing with the spasms, but poisonous doses must be boldly administered by the mouth and rectum. Chloroform has been given by the mouth (ʒi–ij) successfully.

Siebold, in some experiments conducted upon himself as to the physiological action of strychnine,‡ reports that tannin in 10-grain doses was valueless as an antidote. Charcoal in 1-ounce doses had some slight effect, injections of morphine were useful, but chloral hydrate and chloroform sufficed to entirely prevent the muscular contractions, when administered in time.

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* *Op. cit.*, p. 338.

† "Chloroform should be used in strychnine poisoning; not tobacco." Francis L. Haynes, M.D. *Phila. Med. Times*, vol. xiv, p. 504.

‡ *The Chemist and Druggist*, September 6, 1890.

**Therapy.**—Nux vomica is not applied externally, and, although an oleate of strychnine is made, yet it has little, if any, use on account of its uncertainty with regard to absorption. According to Dr. Thomas J. Mays, of this city, an oleate of brucine may be used in paræsthesia of the skin and to relieve itching piles. MacKenzie has known anosmia to be benefited by the insufflation, twice daily, of a powder containing $\frac{1}{24}$ grain of strychnine and 2 grains of starch.

Strychnine not being very soluble, its salts, sulphate, or acetate, may be used hypodermically in the treatment of paralysis (gr. $\frac{1}{80}$ to $\frac{1}{60}$), or injected into the tissues around the eye for amaurosis in tetanus,[*] as an antidote to snake-poison[†] and tobacco-alcohol amblyopia. Dr. Bancroft,[‡] after experiments on guinea-pigs, declares that hypodermic injection of strychnine for snake-poison is useless.

Mr. D. B. Dott recommends strychnine hydrochlorate as regards solubility, neutrality and stability, and considers it the most useful of the salts of the alkaloid. Strychnine nitrate is preferred by many on account of its producing less local irritant effect. It may be used in doses of $\frac{1}{60}$ grain, cautiously increasing until evidence of physiological action is manifested. The dose is then temporarily decreased, to be again raised in such a manner that the physiological effect is obtained about once a week in the treatment of such affections as tobacco-alcohol amblyopia.

The circumstantial reports of many Australian and East Indian physicians, of a number of severe and threatening cases of snake-bite successfully treated by strychnine, leave no doubt as to its value. It is necessary to employ the remedy in large doses, carefully observing its effects. The symptoms due to the snake-poison are progressively relieved and no tetanic spasms indicative of strychnine intoxication are produced. According to the severity of the condition, amounts varying from $\frac{5}{6}$ grain to 3 or 4 grains were given in divided doses in different cases. Dr. E. A. Thomas obtained the same results in five cases from strychnine administered by the mouth, but, as the patient is generally unable to swallow, and on account of the greater rapidity of its action when injected, the hypodermic method is usually the best. On the contrary, from an elaborate series of experiments upon animals, Surgeon-Lieutenant R. H. Elliot, of the British Army, concludes that in animals poisoned by cobra-poison the subcutaneous injection of strychnine often hastens while it could never be said to retard death. The subcutaneous injection of strychnine is beneficial in paralysis due to alcoholism, and has been practised with admirable results by Dr. Königsdörfer in the treatment of toadstool poisoning.

Internally, the tincture of nux vomica does good as a bitter tonic, and in sick-headache from disordered stomach. Ringer gives it in 1-drop doses in a teaspoonful of water, every ten or fifteen minutes, until 10 drops have been taken.

Cases of nausea and vomiting of pregnancy, not infrequently, yield to minute doses of the tincture, a drop, or a fraction of a drop, being given in water, and repeated in an hour or two hours. This preparation, likewise, does excellent service in the morning vomiting to which drunkards are subject. Nux vomica, indeed, fulfills more than one indication in this class of patients. It is beneficial in the chronic gastritis of alcoholism, and affords support to the system when the accustomed alcoholic stimulus is suddenly withdrawn. The poor appetite and digestion, the miserable sense of weakness, the insomnia and tremor, are relieved by the tincture of nux vomica. At the same time, and especially being combined with capsicum, it diminishes the craving for drink, and is of value in assisting to break up the habit. Dr. Jaroshensky has demonstrated by experiments upon dogs that the toxic and narcotic effects of alcohol are neutralized by the administration of strychnine. Hypodermic injections of strychnine nitrate are recommended by various Russian physicians as curative of the alcohol habit. Dr. Portugalow has published a record of 455 cases treated with satisfactory results. He employs the following formula:—

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[*] "Strychnine as a Preventive of Tetanus," by Dr. Peyraud, *Bulletin Médical*, September 2, 1890.

[†] "Strychnine as an Antidote to Snake-Poison," by Dr. Muller, *Druggists' Circular and Chemical Gazette*, January, 1891; "Snake-Poison and its Antidotes," by T. Lauder Brunton, M.D., F. R. S., *British Medical Journal*, January 3, 1891.

[‡] "Strychnine in Snake-Bite." *Journal of the American Medical Association*, February 21, 1891.

| | |
|---|---|
| ℞ Strychnin. nitrat., | gr. j. |
| Aquæ destillat., | f℥ss. |

M.

He begins with one or two daily injections of 8 minims, subsequently reducing the quantity to 4 minims. The treatment is said to soon destroy the taste for liquor, though, on the other hand, Dr. Rabow states that his experience with the method has failed to convince him of its value. Dr. J. Bradford McConnell, of Montreal, made trial of strychnine injections in twenty-five cases of alcoholism. This writer testifies that the craving for alcohol diminished rapidly and was completely lost in a few days. The physical and mental health was gradually restored, but the effect was not permanent, as most of the cases relapsed in from one to eleven months.

Keener recommends the addition of pilocarpine to the strychnine solution in the strength of 1 grain to the ounce. At the same time he administers internally the following mixture:—

| | |
|---|---|
| ℞ Hydrarg. chlorid. corr., | gr. j–ij. |
| Extr. kolæ fl., | fʒj. |
| Extr. cacti grandiflor. fl., | f℥j. |
| Extr. arnicæ fl., | fʒiiss. |
| Tr. aloës, | fʒij. |
| Tr. cannabis Ind., | f℥ss. |
| Aq. destill., | f℥iv. |

M. Sig.: Teaspoonful every two hours during the day.

The gastric catarrh dependent upon chronic disease of other organs, as bronchial tubes, heart, or liver, is also alleviated, as Ringer has pointed out, by the administration of 1 or 2 drops of the tincture in a teaspoonful or two of water every two hours, or oftener, for twenty-four to forty-eight hours. Prolonged and obstinate vomiting, due to malaria, has been overcome by the administration of full doses of strychnine. In atonic dyspepsia and insufficient secretion, nux vomica is useful in pills, with quinine and some carminative. Owing to its effects upon motor nerves, it is valuable in constipation produced by defective muscular activity, and also in the form due to lead poisoning. In the former condition, the contractions of the lower bowel become so energetic that, according to Whitla, the stools are occasionally much altered in size, and may be seen to present the attenuated appearance observed in stricture of the rectum. The effects of nux vomica in constipation are often enhanced by a combination with a purgative and chalybeate.

For constipation, nux vomica can be commended combined as follows:—

| | |
|---|---|
| ℞ Extracti nucis vomicæ, | gr. v. |
| Extracti belladonnæ folior. alc., | gr. iij. |
| Extracti rhamni pursh., | gr. xv vel xxx. |

M. et ft. pil. no. xxx.
Sig.: A pill after each meal.

| | |
|---|---|
| ℞ Extracti nucis vomicæ, | gr. v. |
| Pulveris ipecacuanhæ, | gr. x. |
| Extracti hyoscyami, | gr. xx. |

M. et ft. pil. no. xx.
Sig.: A pill three times a day.

Waugh recommends for constipation this prescription containing nux vomica:—

| | |
|---|---|
| ℞ Extracti nucis vomicæ, | gr. v. |
| Aloës purificat., | gr. v. |
| Ext. belladonnæ folior. alc., | gr. iij. |
| Oleoresina capsici, | gr. ij. |

M. et ft. pil. no. xx.
Sig.: One pill after each meal until two passages occur in a day, when half pills are to be taken; and the reduction is to be continued until the habit of regular evacuations has been formed.

Atony of the large intestine leads to prolapsus ani, and here also the tincture of nux vomica is of advantage, both by internal administration and local injection. Phillips has seen excellent results, in hæmorrhoids, from the tincture. In opposite conditions of the intestine, and for different reasons, strychnine is remedial. In nervous or atonic diarrhœa it materially assists the action of other remedies, and may be thus prescribed with advantage:—

| | |
|---|---|
| ℞ Strychninæ sulphat., | gr. ss. |
| Acidi sulphurici aromat., | f ʒ v. |
| Aq. hamamelidis dest., q. s. ad | f ℥ iv. |

M. et ft. sol.
Sig.: A teaspoonful in water every three hours.

In dysentery attended by unusual prostration and tympanites this remedy has proved of advantage. In combination with a mineral acid it has sometimes seemed to do good in Asiatic cholera. Hypodermic injections of strychnine answer a valuable purpose in cholera, especially when collapse is threatened or is present. This practice has been beneficially followed by Dr. Ffrench-Mullen in hundreds of cases. (*Indian Medical Gazette*, July, 1892.)

Strychnine is one of the best of the cardiac stimulants in failing heart or weakness of the circulation. Prof. Thomas G. Morton uses it in surgical shock. Weakness of the heart due to depressed nerve-force and dilatation of the heart are materially benefited by strychnine. It is a good plan to give this remedy sometimes in combination, and again alternating, with digitalis. Iron is often profitably added to the combination, as :—

| | | |
|---|---|---|
| ℞ Strychninæ sulph., | | gr. $\frac{1}{3}$. |
| Tinct. ferri chloridi, | | fʒij. |
| Infus. gentianæ, | q. s. ad | f℥vj. |

M. Sig.: Tablespoonful in water three times a day.

In fatty heart it is capable of service, but should be given with circumspection, since it will sometimes induce a nervous and sleepless state, which is decidely harmful to the patient. In emphysematous asthma it is especially serviceable. The various forms of muscular paralysis—hemiplegia, paraplegia, diphtheritic paralysis, wrist-drop—are well treated by strychnine internally, or hypodermically (gr. $\frac{1}{120}$) thrown deeply into the affected muscles, in conjunction with electricity. It has also been employed with success in infantile palsy and writers' cramp. In progressive lead-palsy, strychnine stops the advance of the disease if used in full doses, a careful watch being kept up for toxic symptoms and potassium iodide being given simultaneously on account of its eliminative effects. The use of strychnine three or four times daily is also stated to be of particular efficacy in lead colic. Other forms of paralysis in which this agent renders conspicuous service, are torticollis; mercurial, malarial, and hysterical paralysis; neurasthenia from sexual excess and aphonia due to paralysis of the vocal cords. In conjunction with out-door life and calisthenics, nux vomica is useful in lateral curvature of the spine. In atony of the bladder, leading to incontinence or retention, a combination of strychnine and electricity forms the most valuable restorative means at our command.

In general nervousness with depression of spirits Dr. Emmet prescribes :—

| | | |
|---|---|---|
| ℞ Strychnin. sulphat., | | gr. j. |
| Quinin. sulph., | | ʒss. |
| Ferri pyrophosph., | | ʒij. |
| Sp. chloroformi, | | fʒiij. |
| Glycerin., | q. s. ad | f℥iv. |

M. Sig.: Teaspoonful in a wineglassful of water four times a day.

In dyspnœa and shortness of breath attending emphysema, winter cough, or phthisis, strychnine is useful.

Dr. Thomas J. Mays advocates the employment of large doses of strychnine in bronchial and pulmonary disorders, and is accustomed in these cases to push the drug until slight evidence of its physiological action is manifested. Strychnine is of value also in maintaining respiration in narcotic poisoning, as from opium. Nux vomica is of considerable value in the treatment of phthisis. By promoting digestion it maintains nutrition; it deepens respiration and exerts a beneficial effect upon the cough. It relieves the vomiting to which consumptive subjects are liable, and, as Murrell has shown, has some power to check night-sweats. When given with the latter object in view it is best combined with aromatic sulphuric acid. Pinnoy has lately reported good results from the hypodermic injection of strychnine arsenate in four cases of phthisis; 4 to 15 minims of a $\frac{1}{2}$-per-cent. solution in liquid vaseline were given daily.* The same salt, administered by the mouth, has sometimes seemed of value in diabetes mellitus.

In amaurosis and failing eye-sight the tincture of nux vomica may be administered, gradually increasing the dose and watching its effects in order to prevent toxic symptoms. Strychnine is especially beneficial in amaurosis caused by abuse of tobacco or alcohol. In delirium tremens large doses of tincture of nux vomica are not only well borne, but are rapidly curative. The subcutaneous method is particularly adapted to produce prompt and decided relief.

Strychnine is not to be used while neuritis exists, or during the period of vascular reaction after apoplexy. In hypertrophy of the heart it should be given cautiously. In neuralgia due to impaired nutrition we may employ the following pill:—

| | |
|---|---|
| ℞ Zinci phosphid., . . . . . . . . . . | gr. $\frac{1}{10}$ |
| Ext. nucis vomicæ, . . . . . . . . . | gr. $\frac{1}{4}$. |

M. et ft. pil.
Sig.: To be taken every three or four hours.

In simple indigestion and atonic dyspepsia use:—

| | |
|---|---|
| ℞ Extracti nucis vomicæ, . . . . . . . . . | gr. vj. |
| Quininæ hydrochlorat., . . . . . . . . . | gr. xxiv. |
| Pulv. capsici, . . . . . . . . . . . | gr. j. |
| Ext. gentianæ, . . . . . . . . . . | ʒj. |

M. et ft. pil. no. xxiv.
Sig.: Take one or two before meals.

In tobacco amaurosis, de Schweinitz recommends:—

| | |
|---|---|
| ℞ Tr. nucis vomicæ, . . . . . . . . . . | fʒij. |

Take 3 drops three times daily, increasing 2 drops daily until physiological effects are obtained.

| | |
|---|---|
| ℞ Tr. nucis vomicæ, . . . . . . . . . . | fʒj. |
| Acid. nitro-muriatic. dilut., . . . . . . . . | fʒj. |
| Spiritus chloroformi, . . . . . . . . . | fʒj. |
| Infus. gentianæ, . . . . . . . . q. s. ad | f℥vj. |

M. Sig.: Take a tablespoonful or two after each meal for flatulent colic.

Strychnine sulphate, given hypodermically in doses of $\frac{1}{120}$ grain, is a very efficacious remedy in gastralgia and visceral neuralgia in general, as well as in the milder forms of angina pectoris. The same treatment has also been recommended for infra-orbital neuralgia. The tincture has been given with good results in those cases of chorea which arise about the age of puberty, and seem to have no connection with rheumatism, as well also in some cases of chorea major. In idiopathic epilepsy of ill-nourished patients, nux vomica will frequently afford a decided relief. Hæmatosis is promoted by nux vomica, and hence it is of value in the management of anæmia, chlorosis, amenorrhœa, and dysmenorrhœa. It is serviceable in purpura and in post-partum hæmorrhage. Dr. G. V. Hall and Dr. John Milton Duff have independently called attention to the value of strychnine in the late months of pregnancy and during labor. These writers advise its use in the case of women whose previous labors have been retarded, in those subject to severe after-pains or in whom a history exists of post-partum hæmorrhage and subsequent subinvolution. Dr. Hall, when he has reason to fear flooding, subjects his patients more or less constantly to the influence of strychnine during the last five months of gestation with excellent results.

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* Annual of the Universal Medical Sciences, 1890, vol. v, page A-96.

By promoting capillary circulation it is beneficial in cases of habitual coldness of hands and feet. Strychnine aids in overcoming subinvolution of the uterus. It is useful in some cases of spermatorrhœa and impotence.

## OLEANDER.

### *Preparation.*

*Tinctura Nerii. Dose,* ♏x-xx.

**Pharmacology.**—Nerium oleander (Apocyanaceæ), an evergreen shrub, bearing handsome flowers, is a native of the country surrounding the Mediterranean, and well known in this country as a greenhouse or garden plant. A milky juice, of bitter taste, exudes when the young twigs are broken.

Professor Schmiedeberg has found in oleander-leaves a glucoside, oleandrin, and a second active substance which he has named neriin, which he believes to be closely allied to if not identical with digitalin.

**Physiological Action and Therapy.**—The young twigs and the leaves of oleander are poisonous and have proved fatal to children and adults. In a lethal case reported by King, of Bombay, the symptoms were burning pain beginning in the epigastrium and subsequently involving the whole body, unconsciousness, trismus and convulsions. The pupils were widely dilated. A decoction of the leaves and bark is popularly used in the south of France as a lotion in various diseases of the skin. Dr. von Oefele has recently advocated the use of oleander as a succedaneum to digitalis in cases where the latter fails or is ill-borne, and reports seventy-four cases of cardiac disease in which it was found advantageous. Its principal effect is said to be the diminution of the rapidity of the pulse. Oleander increases the blood-pressure and promotes the action of the kidneys. The influence upon the circulation continued, in some instances, as long as two weeks after cessation of administration. Oleander was given in the form of a 10-per-cent. tincture, in doses of 20 drops three times a day.

According to the writer quoted, oleander is useful in diseases of the kidney, and myocardium and in atheroma. It is contra-indicated by the presence of vomiting or diarrhœa.

**OLEUM ÆTHEREUM** (U. S. P.).—**Ethereal Oil.** See Æther.

**OLEUM MORRHUÆ** (U. S. P.).—**Codliver Oil.** See Morrhuæ Oleum.

**OLEUM MYRCIÆ** (U. S. P.).—**Oil of Myrcia** or **Bay.** See Myrcia.

**OLEUM OLIVÆ** (U. S. P.).—**Olive-Oil, Sweet-Oil.**

**Pharmacology.**—Sweet-oil is a fixed oil expressed from the ripe fruit of Olea Europea (Oleaceæ). It consists largly of **Olein** (more than two-thirds), with some solid fat, **Tripalmitin.** The best or virgin oil is obtained from the crushed ripe fruit, by expression without heat; a second quality is obtained by the addition of hot water to the same crushed fruit and expressing again. An inferior grade is made from the residue, after boiling, with the aid of very strong pressure. The best is nearly tasteless and without color. the second has more taste and color, and the third is dark and more or less rancid, with strong odor. The better varieties are used upon the table, as salad-oil, and also in pharmacy. Olive-oil enters into lead plaster and diachylon ointment. Cottonseed-oil and peanut-oil are used very largely as substitutes, but have not the agreeable flavor of olive-oil.

**Physiological Action and Therapy.**—Olive-oil is a lubricant, and is added to poultices as an emollient in pneumonia and in skin diseases. Carbolized oil (1 to 24) is a valuable dressing for wounds. Internally, olive-oil is nutritious and laxative, and is a purgative for infants (in doses of a teaspoonful). During its use, the infant may pass lumps of white fat, resembling beans, composed of undigested tripalmitin. In adults, it is a useful remedy in all forms of irritant poisoning, except that by phosphorus; it is also a good enema. Given internally, in the dose of ½ ounce to 1 ounce, olive-oil will often relieve simple constipation in adults, especially when the condition has been produced by opium. It may be employed with advantage as a demulcent laxative in hæmorrhoids and fissure of the anus. Much has been written of late concerning the value of this oil in gall-stone and hepatic colic. It has been freely administered in large doses (3 to 6 ounces) and was thought to aid in the expulsion of the concretions. While it seems to have some power to alleviate pain, it has no other influence, and the stones supposed to be passed during its use have been shown to be, in many cases, merely fatty masses.

Olive-oil, in doses increasing from ½ to 3 ounces, has been known to cause the disappearance of obstructive jaundice. Dr. Oliver reports one case in which jaundice had been present for ten months, but vanished within three weeks under the use of olive-oil. At the same time the general condition improved. The ingestion of a tumblerful or more of the oil during the day is an old treatment, recently revived, for lead colic. It is particularly advocated by Dr. Weill, of Lyons. It is stated that pain is relieved from the beginning of the treatment, that constipation begins to yield on the second or third day and is soon succeeded by diarrhœa. The free evacuation of the bowels is attended by the subsidence of the nervous manifestations.

The late Dujardin-Beaumetz expressed a favorable opinion of the action of olive-oil in hepatic colic, and remarks that failure constitutes the exception, that the large doses are well borne and do not cause vomiting. He was in the habit of combining ox-gall with the oil in the proportion of 1 part of the former to 10 parts of the latter. Rosenberg has experimentally demonstrated that olive-oil stimulates the secretion of bile and promotes its fluidity. This writer regards the bile as the immediate agent in the removal of calculi.

In scarlatina and other febrile affections, the application of oil to the skin reduces the temperature. In the desquamative stage of scarlatina, it is of prophylactic utility by restraining the dispersion of scales through the atmosphere. Olive-oil has likewise been used by inunction in wasting diseases, and is of undoubted service, though of less value than codliver-oil. In a case of extreme weakness and emaciation due to malignant stricture of the œsophagus, Caird practised intramuscular injections of sterilized olive-oil. It is stated that considerable benefit resulted from this procedure, and it is suggested that other conditions might be advantageously treated in the same manner.

Insects, which occasionally find their way into the external auditory meatus, may be easily removed by dropping a small quantity of this oil into the canal. Dr. C. R. Earley administers sweet-oil freely in cases of snake-bites, and says it has never failed in his hands. According to Dr. Cérenville, of Lausanne, the injection of 30 drops of sterilized olive-oil in obstinate and painful cases of dry pleurisy is of value by imitating nature in providing a lubricating fluid. The oil is thrown into the pleural sac, the site of injection being the spot where friction sounds are most distinctly heard.

A **white emulsion** is made by rubbing up powdered gum acacia (308 grains) with olive-oil (3 ounces), and when thoroughly mixed gradually adding orange-flower water and syrup (of each, 2 ounces). It is used, either alone or in combination with opium, in treating dysentery, tenesmus, irritation of the bowels, etc. **Lipanin,** a combination of olive-oil and oleic acid, has already been referred to. It is recommended by von Mering as a substitute for codliver-oil, but it is too expensive as compared with the other, and is not so serviceable as an alterative.

**OLEUM RICINI** (U. S. P.).—**Castor-Oil.** See Ricinus.

**OLEUM SANTALI FLAVI** (U. S. P.).—**Oil of Sandal-Wood.** See Santalum.

**OLEUM SUCCINI** (U. S. P.).—**Oil of Amber.** See Succinum.

**OLEUM THEOBROMATIS** (U. S. P.).—**Cacao-Butter.** See Theobroma.

**OLEUM THYMI** (U. S. P.).—**Oil of Thyme.** See Thymus.

**OLEUM TIGLII** (U. S. P.).—**Croton-Oil.** See Tiglium.

**OLEUM ZEÆ MAIDIS.**—**Oil of Indian Corn.** See Zea Mays.

**OPIUM** (U. S. P.).—**Opium.**
**Dose,** gr. ¼–iij.

*Preparations.*

*Opium Deodoratum* (U. S. P.).—Deodorized Opium. *Dose*, gr. ss–j.

*Extractum Opii* (U. S. P.).—Extract of Opium (morphine, 18 per cent.). *Dose*, gr. ¼–½.

*Opii Pulvis* (U. S. P.).—Powdered Opium (morphine, 13 to 15 per cent.). *Dose*, gr. ss–j.

*Pilulæ Opii* (U. S. P.).—Pills of Opium (each 1 gr. powdered opium). *Dose*, one pill.

*Emplastrum Opii* (U. S. P.).—Opium Plaster (extract, 6 per cent.).

*Trochisci Glycyrrhizæ et Opii* (U. S. P.).—Troches of Liquorice and Opium, Wistar's Cough Lozenges. *Dose*, j to x.

*Pulvis Ipecacuanhæ et Opii* (U. S. P.).—Powder of Ipecac and Opium, Dover's Powder (ipecac and opium, of each 1 part, sugar of milk 8). *Dose*, gr. x.

*Tinctura Opii* (U. S. P.).—Laudanum. *Dose*, ♏i–xx.

*Tinctura Opii Deodorati* (U. S. P.).—Tincture of Deodorized Opium. *Dose*, ♏i–xx.

*Tinctura Ipecacuanhæ et Opii* (U. S. P.).—Tincture of Ipecac and Opium, Fluid Dover's Powder. *Dose*, ♏v–x.

*Tinctura Opii Camphorata* (U. S. P.).—Paregoric. *Dose*, fʒj–℥ss.

*Vinum Opii* (U. S. P.).—Wine of Opium (10 per cent.). *Dose*, ♏v–xx.

*Acetum Opii* (U. S. P.).—Vinegar of Opium (10 per cent.). *Dose*, ♏v–xx.

*Mistura Magnesiæ et Asafœtidæ.*—Dewees's Carminative (mag. carb. 5, tr. asafœtida 7, tr. opium 1, sugar 10, water q. s. ad 100 parts). *Dose*, fʒss–iv.

*Mistura Glycyrrhizæ Composita* (U. S. P.).—Compound Mixture of Glycyrrhiza, Brown Mixture (paregoric 12, antimonial wine 6, sweet spirit of nitre 3, extract liquorice, sugar, acacia, and water). *Dose*, fʒj–f℥ss.

*Codeina* (U. S. P.).—Codeine, gr. $\frac{1}{4}$–ij.

*Narcotinæ Hydrochloras.*—Narcotine Hydrochlorate. *Dose*, gr. ii–x.

*Morphinæ* (U. S. P.).—Morphine. *Dose*, gr. $\frac{1}{10}$–$\frac{1}{2}$.

*Morphinæ Acetas* (U. S. P.).—Morphine Acetate. *Dose*, gr. $\frac{1}{6}$–$\frac{1}{2}$.

*Morphinæ Hydrochloras* (U. S. P.).—Morphine Hydrochlorate. *Dose*, gr. $\frac{1}{6}$–$\frac{1}{2}$.

*Morphinæ Sulphas* (U. S. P.).—Morphine Sulphate. *Dose*, gr. $\frac{1}{6}$–$\frac{1}{2}$.

*Apomorphinæ Hydrochloras.*—Apomorphine Hydrochlorate. *Dose*, gr. $\frac{1}{6}$–$\frac{1}{4}$.

*Pulvis Morphinæ Compositus* (U. S. P.).—Compound Morphine Powder, Tully's Powder. *Dose*, gr. v–xv.

*Morphinæ Oleatum.*—Oleate of Morphine (10 per cent.). External use.

*Tinctura Chloroformi et Morphinæ* (B. P.).—Tincture of Chloroform and Morphine. (See Chlorodyne.) *Dose*, ♏v–x.

*Mistura Opii et Ipecacuanhæ Composita.*—Swedish Cholera Drops, Thielemann's Cholera Drops (oil of peppermint, 1 oz.; alcohol, 8 oz.; tincture of opium and saffron [Sydenham's laudanum], 3 oz.; tinct. of opium, 8 oz.; tinct. of valerian, 13½ fl. oz.). *Dose*, fʒi–ij.

*Confectio Opii* (Ph. 1870).—Confection of Opium (powd. opium 1, aromatic powder 12, honey 28 parts). *Dose*, gr. x–xx.

*Papaveris Capsulæ.*—Poppy-Capsules (of uncertain and variable narcotic effect).

*Syrupus Papaveris.*—Syrup of Poppy-Capsules (of variable narcotic strength). *Dose*, to a child, fʒss–j; to an adult, f℥ss–j.

*Syrupus Rhœados.*—Syrup of Red Poppy-Flowers (no narcotic effect). Used as a vehicle.

*Oleum Papaveris Seminis.*—Poppy-seed-Oil (a bland oil, used to adulterate olive-oil and resembling it in character).

**Pharmacology.**—The concrete, milky exudation, obtained in Asia Minor by incising the unripe capsules of Papaver somniferum (Papaveraceæ), constitutes **Opium**, which, in its inspissated form, occurs in chestnut-colored masses or lumps with an earthy, narcotic odor and bitter taste. In its commercial condition, as a moist, soft solid, it should contain not less than 9 per cent. of morphine; it loses about 20 per cent. of its weight in the process of drying. When dried and powdered, the pharmacopœia directs that it shall contain not less than 13 per cent., nor more than 15 of morphine. The principal properties of crude opium are extracted by water, alcohol, and dilute acid, but not by ether. When broken it should exhibit a notched fracture, and should leave an interrupted stain when drawn across white paper. Since all commercial opium contains more or less admixture of foreign material, or adulteration, the best preparation is the denarcotized opium, obtained by dissolving and removing narcotine and other matters soluble in ether, and standardizing the product to the uniform strength of 14-per-cent. morphine. By employing deodorized opium in making Dover's powder a superior product is obtained, less disagreeable to the taste and less likely to cause nausea than that made from the ordinary powdered opium. A syrup of opium and ipecac may also be made with deodorized opium, so that each teaspoonful will represent 10 grains of Dover's powder. The preparations that pharmacy offers to the physician of this ancient and valuable remedy are innumerable, but they are all dependent for their activity upon the presence of certain proximate principles. It had been long suspected that a **vis dormitiva**, or narcotic element, existed in opium and gave it medicinal value, but it was not until 1817 that a crystalline body was isolated by Sertürner, which he correctly considered as the salt of an organic acid to which he gave the name of **Meconic acid.** The sleep-producing principle he named morphium in honor of the drowsy god, but this has been since changed to **Morphine**, in order to make it conform in terminology to the other organic alkaloids of the pharmacopœia. Since then, other alkaloids and proximate principles have been separated from opium, some of which possess narcotic power, some have not, and one, at least, is a tetanizer resembling strychnine. The principal constituents and alkaloids are as follows:

Morphine (at least 9 per cent. in crude opium); the principal narcotic constituent. Codeine ($\frac{1}{2}$ per cent.); about half the narcotic strength of morphine, but more calmative. Narcotine (2 to 10 per cent.); no narcotic effects; antiperiodic. Thebaine or paramorphine (less than $\frac{1}{4}$ per cent.); convulsive agent and spinal excitant. Narceine (0.02 per cent.); resembles morphine, but has less disagreeable after-effects. (A new and more soluble narceine has recently been prepared by Dr. Laborde and M. Duquesnel.*) Papaverine (1 per cent.); narcotic and convulsant. Also cryptopine, pseudo-morphine, protopine, cotomine, laudanine, codamine, rhœadine, meconidine, laudanosine, lanthopine, and gnoscopine in small amounts, with neutral principles, meconin, meconoisin, and porphyroxin, and meconic and lactic acids.

A new alkaloid has been discovered in opium and is named xanthaline on account of the yellow color of its salts. Xanthaline is so feeble a base that when one of its salts is placed in water the acid separates, leaving the alkaloid, which is nearly white in color. By the action of nascent hydrogen on xanthaline another base, hydroxanthaline is formed, the sulphate of which occurs as hard, white crystals.

It is probable that these principles exist in a highly complex arrangement in opium, and that separately none of them completely represents the drug; possibly some of them are derivatives of the others, and not separate compounds. **Apomorphine** is a derivative of morphine, devoid of narcotic effect, causing prompt emesis.

Some of the chemical reactions and tests of opium are interesting. Solutions containing meconic acid turn red in contact with the tincture of ferric chloride, and the same reagent turns morphine blue, afterward changing to green; nitric acid turns morphine to blood-red, changing to yellow. According to Wormley, the nitric acid test is capable of detecting $\frac{1}{10000}$ grain of morphine in the dry state.

A new test for morphine has lately been described by M. Laneal. A few drops of a suspected fluid being placed in a porcelain capsule there is added an equal quantity of a solution of 30 parts of uranium acetate and 20 parts of sodium acetate in 1000 of distilled water. The mixture is evaporated over a water-bath, and if morphine be present a brownish-red or orange deposit is left in the form of concentric rings.

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* *Therapeutic Gazette*, September 15, 1890, p. 639.

Opium preparations, in solution, afford precipitates with solutions of many of the metals in the form of an insoluble meconate. The alkaloids are precipitated by the addition of an alkali or tannic acid. This is of importance in prescription-writing. It should also be stated that there is present a small proportion of glucose in gum opium, which chemically makes it incompatible with silver nitrate, and pills containing these in combination may explode. The formerly much used lead-water and laudanum mixture is dependent for some of its effect upon the extemporaneously formed meconate of lead, which is of a yellow color and is unsightly and dirty; dilute lead-water, with alcohol, will probably answer the purpose nearly as well and is colorless.

**Morphine** occurs in the form of colorless, flat, six-sided prisms, destitute of smell, but having a very bitter taste. It melts at about 330° F., and is destroyed by more elevated temperatures, is insoluble in cold water and ether, sparingly soluble in boiling water, more freely soluble in alcohol and chloroform. The solutions of morphine possess an alkaline reaction. It dissolves without decomposition in solution of potassium. On account of its insolubility in water it is employed for medicinal purposes in the form of its soluble salts.

**Codeine** is present in opium combined with meconic acid and is separated from morphine by means of an alkaline solution. This is a colorless, crystalline substance, anhydrous or hydrated, depending upon whether it crystallizes from an ethereal or aqueous solution. Its solutions are bitter to the taste and of an alkaline reaction. Codeine dissolves in water, alcohol, ether, and chloroform. In this country it is generally administered in the form of the sulphate. **Apocodeine** is a derivative of codeine, obtained by heating codeine hydrochlorate with a concentrated solution of zinc chloride.

Hager has shown that opium and morphine in solution, when exposed to a temperature between 203° and 212° F., lose a considerable portion of their narcotic power. To these preparations he gives the name of mitigated opium. After subjection to this process the residue may be reduced to powder, from which preparations corresponding to ordinary opium may be made. The mitigated preparations may be useful in cases of children, women and debilitated individuals.

**Physiological Action.**—Opium is a stimulant, narcotic, anodyne, antispasmodic, and intoxicant. Its taste is bitter and somewhat acrid; it gives rise to a sensation of dryness in the mouth and throat, and subsequently to a viscid secretion, with huskiness of the voice. It restrains the movements and checks the secretions of the stomach and intestinal canal. As a result of his experiments, Nothnagel concluded that opium in moderate doses stimulates the inhibitory nerves of the intestine, but paralyzes them when given in excessive doses. This accords with the observed fact that under the influence of this drug constipation is not infrequently followed by exaggerated peristalsis and free evacuation of the bowels. The pancreatic and hepatic secretions are lessened, and the stools sometimes become clay-colored under the influence of opium.

The action of opium and morphine upon the bowel has been studied anew by Spitzer, whose experiments were conducted upon frogs, rabbits and men. The sensitiveness of the bowel to painful impressions was diminished by small doses of the watery extract given subcutaneously, the effect being due to a local influence upon the nerve-centres in the wall of the bowel. Large doses are required to diminish peristalsis. Morphine has the same influence as opium, but the other alkaloids have little action upon the intestine. In healthy men opium given subcutaneously has somewhat less action upon the bowel than when given by the mouth. Leubuscher has made a comparative study of the influence of the opium alkaloids upon the movements of the bowel. He concludes that morphine is the most efficient agent in allaying intestinal movements. Papaverine comes next to morphine in this respect. Narcotine is much more feeble. Narceine and codeine are altogether inefficient. From $\frac{1}{6}$ to $\frac{1}{3}$ grain of thebaine excited violent intestinal contractions.

The drug is not perfectly represented by morphine, and many persons are able to take some of the opium preparations with good results, although made sick by morphine. In discussing the physiological action, however, it will lead to no confusion if we consider them together. In order to produce its characteristic effects, opium, or its active principles, must be absorbed into the blood and carried to the motor and sensory and higher nervous centres, and to the terminal end-organs of nerves. Having been carried to the brain and cord, the functions of the ganglion-cells are at first stimulated, and secondarily depressed or inhibited, probably owing to the salts diffusing through the cell-wall and entering temporarily into combination with the protoplasm. Subsequently they are removed by fresh supplies of blood and carried to the excretory channels, particularly the alimentary canal and kidneys. E. Tauber found that when morphine was administered hypodermically to dogs, for several days, he was able to recover 41.3 per cent. of the drug from the fæces.* Morphine has a different effect upon dogs and cats. In the former it exerts a narcotic influence, but M. Guinard has observed that it acts as an excitant upon cats. This effect is in proportion to the dose employed. When lethal amounts were given death was preceded by convulsions.

Alt has shown that after injection, subcutaneously, morphine can be detected in the stomach. Further investigation by Hitzig has shown that consecutive to this excretion of morphine by the stomach the quantity of the gastric juice is decreased and its acidity is lessened. When the action of the drug is at an end an excess of hydrochloric acid is secreted. In one case the same effect upon the acidity of the gastric juice was demonstrated in the human being. Rosenthal points out that the salivary glands also separate morphine from the blood. In the case of patients who were taking no more than $\frac{5}{6}$ grain daily the characteristic reaction of morphine could be obtained. A cumulative action was likewise observed. In patients taking only $\frac{1}{6}$ grain daily the reaction failed to make its appearance until after the lapse of three or four days. As the saliva is so much more easily obtained than the contents of the stomach, this observation may prove of medico-legal interest. Rosenthal has shown, moreover, that the elimination of morphine is independently performed by the salivary glands and by the stomach. After making its appearance in the saliva the reaction could be obtained for several days, and it is probable that a considerable proportion is excreted by this route. Morphine does not appear to be destroyed or materially altered in passing through the animal organism. It seems probable, however, that small amounts of the alkaloid are decomposed within the body, while larger quantities escape without change. Opium is likewise eliminated by the skin and kidneys. Elimination seems to proceed slowly, as morphine has been found in the urine several days after the drug had been discontinued.

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* "Ueber das Schicksal des Morphins im thierischen Organismus," *Archiv für Experimentelle Pathologie und Pharmakologie*, July 24, 1890.

The paper of Drs. R. Stockman and D. B. Dott on "The Pharmacology of Morphine and Its Derivatives" (*British Med. Journal*, July 26, 1890), and that read by Dr. Stockman "On the Pharmacology of Some Bodies Derived from Morphine" (*Transactions Ninth International Med. Congress*, Washington, 1887, vol. iii, p. 47), contain the results of a laborious series of investigations in a very interesting field, and form a valuable contribution to our knowledge of the influence of chemical change on physiological action, as well as to the pharmacology of morphine. Their conclusions only can be stated here; for details the reader is referred to the original sources. Morphine primarily affects the nervous system; in small doses it depresses the action of the spinal cord; in larger doses it stimulates it, even to the production of convulsions. The late appearance usually of increased reflexes is accounted for on the ground that at first only a small quantity f morphine reaches the cord. It has been held by some observers that morphine is capable of directly paralyzing the motor endings of nerves. Stockman and Dott record experiments tending to show that morphine does paralyze more or less completely the nerve-endings, but only when large amounts come in contact with them. In the case of the sensory nerves the action is much the same. In man, tetanic symptoms are very exceptional, for, after therapeutic doses, the amount of morphine reaching the peripheral nerves is not usually sufficient to affect them. In infants and young children, however, convulsions not uncommonly occur as a result of poisoning by opium. Viewing morphine ($C_{17}H_{19}No_3$) as a compound containing two hydroxyl groups, the hydrogen of one or both of these groups may be substituted by more or less complex radicles, forming derived bodies, which, being tested, produce positive physiological results, more or less approaching those of morphine. From these researches they conclude that chemical changes, restricted to what may be called the outlying groups of the molecules, cause very little change in the physiological action, but where a change is made in the kernel or groundwork of the molecule the action is much more profoundly altered. In codeine or methyl-morphine, they found that the narcotic action was much diminished by the substitution of the alkyl radicle for the hydrogen atom, whilst the tetanic action and the action on the motor nerves were increased. The paralyzing effect on the motor nerve-endings was also more decided. Codeine is anodyne and hypnotic, and causes less general disturbance than accompanies the action of morphine. The generative functions are depressed by opium, and in chronic poisoning the menses cease and men become impotent while under its influence. Passower has demonstrated that the abuse of morphine may occasion atrophy of the female generative organs. In a patient observed during two years it was inferred, from the early failure of menstruation, that the atrophic process began in the ovary. During the period named the uterus diminished in size by $1\frac{2}{10}$ inches and atrophy of the vulva was evident. The secretion of urine is lessened, but the bladder is often rendered irritable and urine is passed frequently in small quantities. On the other hand, partial paralysis, with retention, may occur. Althoff has proved experimentally that degeneration of the posterior columns of the cord in the dorsal region was produced in dogs who had for a long period received hypodermic injections of morphine. This observation is in consonance with the clinical fact that morphine habituates in some instances manifest ataxic symptoms. This drug increases the amount of urea and phosphoric acid eliminated.

The hypnotic action of opium is due partly to the lessened activity of the cerebral cells and partly to a reduction of the blood-supply to the brain-centres. It is therefore a cerebral depressant. Small doses, however, 1 grain or less, temporarily arrest all the secretions except that of the skin, and stimulate the circulation; the heart's action is increased, arterial tension raised, and the pupils contract and do not respond well to light. Slightly quickened at first, the action of the heart soon becomes more slow and forcible. Immoderate doses may cause rapid and feeble action. These effects are attributable to exaltation or depression of the function of the pneumogastric nerve.

With this, in some persons, there is exhilaration and increased cerebration, with a sense of calm and indisposition to sleep until the effect passes away, when sleep occurs, from which the subject wakens with a headache, disordered stomach, and constipated bowels. In others, cerebral activity does not occur, but the spinal functions are exalted and restlessness occurs, with some irritation of the skin, or even an erythematous eruption. At times a general rash, resembling that of scarlet fever, is witnessed, and this eruption may be succeeded by desquamation. In a case reported by Dr. A. J. Lanz the eruption was of this character and its development was preceded by severe rigor, fever and headache. In other cases an urticarial efflorescence may appear. Itching of the skin is a very common result of a dose of opium. In some persons the soporific effect is followed by severe physical depression, accompanying sickness of the stomach. In others, small doses of opium or its alkaloids occasion syncope and alarming dyspnœa. This substance exerts little or no local action. Its active principles, however, are quite readily absorbed through the unbroken skin.

Morphine, hypodermically injected, is less apt to affect the appetite and bowels than opium given by the mouth. If, however, the solution should be thrown directly into a vein, temporary dyspnœa and clonic spasm may be produced. Larger doses arrest digestion and may cause vomiting with diaphoresis. The heart and circulation are depressed;

the bodily temperature is reduced. A stuporous sleep is produced, with irregular and slow respiration, cool, clammy skin, and pin-point contracted pupils. In other cases coma-vigil and delirium may occur. Infants are extremely susceptible to the influence of opium. The drug should be administered to them in small doses, and its effects carefully watched. Aged people, also, bear it less well than those in the prime of life. Women are more amenable to the drug than men, and require smaller doses.

As instances of the aberrant effects of morphine Professor Edward T. Reichert points out that morphine will sometimes cause wakefulness in doses which ordinarily produce sleep and that instances are on record which show that in some people the administration will give rise to pain. In experiments upon·dogs he has also occasionally found this alkaloid to act as a respiratory stimulant. These idiosyncrasies represent the persistence of the primary effects of the drug. Pain results from a stimulant or excitant effect upon the sensory cells of the nerve-centres.

The action of codeine resembles that of morphine, but is less decided. It is not so apt to derange the stomach or produce constipation. Codeine is not so potent an anodyne or hypnotic as morphine. Excessive doses have caused alarming prostration and distressing pruritus. In a case described by Dr. Spratling the symptoms produced by taking 8 grains of codeine were nausea, vomiting, restlessness, convulsions, slow respiration, intense thirst, feeling of fullness in the head and extreme irritation of the skin. The patient did not sleep or lose consciousness, but the pupils were fixed and contracted to a pin-point.

Intoxication from codeine is treated upon the same principles as that produced by the ingestion of morphine or opium. A tolerance of opium is soon established, and, in those to whom it is constantly given, the dose must, from time to time, be increased in order to produce the desired results. **Protopine**, according to the experiments of Engel,* produces in mammals an action similar to camphor, death following its use by a paralysis of the respiratory centre. Fubini and Benedicenti have investigated the properties of laudanine, a crystallizable substance which forms salts with the acids. It appears to act principally upon the spinal cord, causing at first tetanus and afterward paralysis.

**Poisonous Effects.**—If a fatal dose has been taken, the above symptoms intensify, the pulse becomes slower, respiration is reduced to five or six to the minute, the reflexes become abolished, and death occurs from paralysis of the respiratory centre, or carbonic-acid accumulation in the blood. Post-mortem examination may show some of the drug yet remaining in the stomach or intestines, and the internal organs reveal considerable venous congestion, especially the lungs. Laudanum is the agent most frequently taken with suicidal intent, and its presence may often be detected simply by the odor of the contents of the stomach.

**Diagnosis of Opium Poisoning.**—Opium poisoning may be mistaken for cerebral apoplexy or alcoholic intoxication, but attention to a few points of diagnosis will prevent error. The history may, or may not, assist in deciding the question. In **apoplexy** there is no contraction of the pupils (except in one case which will be mentioned presently), the eyes are deviated to one side, the sides of the face may not be symmetrical, and there is also paralysis of one or both limbs. The symptoms come on suddenly, often on rising in the morning; there is generally no history of taking any poison or food immediately before the attack; the face is congested or pale, not swollen and cyanosed as in opium poisoning. In hæmorrhage into the pons Varolii, there is contraction of the pupils, but, as such cases are rare and generally fatal, the mistake will not be often made; moreover, the attack is sudden and the entire body is relaxed with involuntary evacuations of the contents of the bowels or bladder, which does not occur in opium poisoning. In **alcoholic intoxication** the patient can be roused and will answer questions; the pupils may be contracted, but will dilate when the patient is disturbed, or his beard is pulled; the odor of alcohol may assist in the diagnosis. It is possible, however, for the patient to swallow laudanum at the close of a drinking bout, and thus have both forms of intoxication. Uræmic coma might possibly be mistaken for opium poisoning, but in the former condition œdema is generally present, and the urine contains albumin and casts.

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* *Gazette Médicale de Paris*, October 11, 1890.

**Treatment of Poisoning.**—The stomach should be promptly evacuated with zinc sulphate or ipecacuanha, or by using the stomach-pump. Emetics must be given in large doses on account of the insensitive condition of the stomach. A tablespoonful of mustard or alum in water acts as an efficient emetic, or apomorphine may be given hypodermically. Tannic acid may be given as a chemical antidote. A pint or two of warm (not boiling-hot) coffee should be injected into the stomach and rectum. Artificial respiration should be practised both by Sylvester's method and by the application of the faradic current, one pole to the cervical region and one over the ensiform cartilage. No attempt should be made to directly faradize the phrenic nerve, on account of the danger of paralyzing the heart. The circulation should be maintained by massage, rubbing the blood up toward the body from the extremities, and, if the blood is heavily carbonized, venesection of 12 to 16 ounces may be performed with advantage. The surface of the body may be stimulated by the faradic brush, or by whipping with the fringed ends of towels or with twigs. The patient should be made to walk about supported by two assistants, as soon as he is restored to consciousness, and kept walking for six or eight hours, or until the influence of the opium has entirely passed off. Nevertheless, this exercise should not be too long continued on account of its exhausting effect upon the muscular system and heart. The capital point in the treatment is maintenance of respiration. If the measures instituted are found to gradually increase the number of respirations per minute, the coma, in itself considered, need not be feared. The catheter should be used from time to time in order to encourage excretion by the kidneys. The patient should not be exposed too much to cold, on account of his lowered temperature and the danger of pulmonary congestion. The physiological antagonists—atropine, caffeine, or strychnine*—may be used cautiously, but only in physiological doses. Atropine may be injected hypodermically in doses of gr. $\frac{1}{120}$—$\frac{1}{100}$ if the respirations become very slow, but the state of the pupil is no guide to the effect of the antidote. Strychnine can be administered subcutaneously in from $\frac{1}{100}$ to $\frac{1}{20}$ grain every hour or two until an improvement in the respiration takes place. Ammonia inhalations are useful, and when properly used are harmless. Opium poisoning produces no characteristic lesion. By reason of idiosyncrasy alarming results have followed the administration of small medicinal doses.

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* See papers, "Strychnine in Poisoning from Narcotics," by Dr. G. A. Gibson, in *Practice*, December, 1888; "Some of the Uses of Nux Vomica and Strychnine," by Dr. Frank R. Fry, in *Weekly Medical Review*, February 23, 1889; "Strychnine in Opium Poisoning," by Dr. Clara T. Dercum, in *University Medical Magazine*, January, 1891.

Dr. William Moor, of New York, has introduced potassium permanganate as a chemical antidote to opium. He has demonstrated that if given while the poison still remains in the stomach the permanganate decomposes the morphine. A quantity of the antidote at least equal to the amount of morphine swallowed should be administered, well diluted with water. Some cases have been reported in which this mode of treatment proved effectual even after absorption had occurred. The older methods may be used in conjunction with this treatment. Hayes reports a case of opium poisoning cured by hypodermic injection of three grains of potassium permanganate every hour until twelve grains had been given.*

In desperate cases recourse may be had to artificial respiration. Dr. George E. Fell practises what he terms "forced respiration," a method which consists in opening the trachea and forcing air into the lungs by means of a mechanical appliance. He has used this method successfully in eleven cases, of which five would, in all probability, have proved fatal under any other treatment. As a result of this procedure he has seen recovery after 20 grains of morphine had been taken.

As a rule, no after-results follow recovery from opium poisoning, but a case of amaurosis has been reported due to this cause, and glycosuria also is said to have occurred in consequence of the intoxication. The smallest dose recorded as having proved fatal to an adult is $\frac{1}{6}$ grain of morphine.

**Treatment of Opium Addiction.**—The treatment of chronic morphine poisoning, or opium-eating, is more moral than medical. In such cases the will of the unfortunate victim is so weakened by self-indulgence that the acquired taste for the drug cannot ordinarily be resisted, and he will acquire means for its gratification at any cost, or, if it is not obtainable, he may destroy himself. The medical attendant, before undertaking the treatment, must thoroughly gain the confidence of the patient; he should try to establish an understanding, and, if possible, sympathy, with him. He should make sure that the patient really wishes to escape from the terrible thraldom of the drug, and will co-operate with his physician. The patient should be put upon his honor, and pledge himself to obey orders and confine himself to the quantity permitted by his physician and to medicines passing through his hands. The daily amount must first be accurately determined, and an effort made at once to reduce this one-half, afterward diminishing day by day, supplementing the treatment by ammonium valerianate, fluid extract of coca, or camellia, with tonics, easily-digested food frequently given, and some alcohol, in the form of an elixir preferably. It is advantageous to change the form of the drug: if the patient has been taking laudanum or other opiate, give morphine instead; if he has been taking morphine sulphate, change it to the valerianate or some other salt. A change of scene is often beneficial. Dr. Waugh recommends a paste of coca-leaves and aromatics, and the galvanic current in treating such cases. Dr. Woodbury prefers the gelatin-coated pills of morphine valerianate, owing to their convenience, and because other pills can be gradually substituted without the patient's knowledge. Massage is a useful adjunct to the treatment. Cottel (*American Practitioner and News*) recommends the following prescription for morphinism:—

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* *New York Medical Record*, May 25, 1895.

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| ℞ Morph. sulph. or tr. opii, | | q. s. |
| Ext. viburni prunifol. fl., | | f℥ss. |
| Elixir. ammoniæ valerianat., | | f℥iij. |
| Elixir. sodii bromidi (gr. v to the fʒ), | q. s. | f℥vj. |

M. Sig.: Teaspoonful when required.

This is a mixture from which one is readily weaned when the opiate is withdrawn.

Some practitioners esteem codeine as of value in the treatment of morphinism. As the quantity of morphine is gradually reduced, codeine, in as small doses as possible, is substituted. It is thought to be of service in allaying the craving for the more powerful alkaloid.

**Therapy.**—Powdered opium may be mixed into a paste with water and applied to an incipient boil with relief. Laudanum with water is a useful application to sprains and bruises; and it may be added to poultices to form an anodyne fomentation. Laudanum may be applied to wounds as an antiseptic and to relieve pain; and after heating in a spoon, to drive off the alcohol, it is a domestic remedy for earache, but the auditory canal should, in a few moments, be washed out with hot water. If there is a perforation of the ear-drum, a child might be narcotized in this way, by the drug passing down the Eustachian tube into the throat. Many anodyne liniments contain opium, and when these are applied with friction the remedy is partly absorbed. Such applications assuage the pain of chronic or muscular rheumatism, and even, at times, of sciatica. A warm lotion containing opium affords relief in synovitis and orchitis. Laudanum is usually a serviceable topical remedy in painful ulcers.

Opium may be combined and used thus locally:—

| | | |
|---|---|---|
| ℞ Tinct. opii, | | f℥j. |
| Chloroformi, | | |
| Tinct. aconiti, | āā | f℥ss. |
| Ol. menth. pip., | | f℥j. |
| Lin. saponis, | | f℥ij. |

M. Sig.: Apply well over the surface for neuralgia or rheumatism.

| | | |
|---|---|---|
| ℞ Tinct. opii, | | |
| Aquæ hamamelidis dest., | | |
| Aquæ camphoræ, | āā | f℥ij. |

M. For an application to acute gout or rheumatism.

| | | |
|---|---|---|
| ℞ Tinct. opii, | | |
| Spiritus vini rectificati, | | |
| Aquæ hamamelidis, | āā | f℥ij. |

M. Serviceable in synovitis, felons, or orchitis.

℞ Tinct. opii,
Ext. arnicæ fl.,
Lin. saponis, . . . . . . . . . . . āā f℥j.
M. For enlarged glands and thickened states of the skin.

℞ Extracti opii,
Extracti arnicæ,
Extracti belladonnæ folior alc., . . . . . . āā ʒj.
Ungt. hydrargyri oleatis (10 per cent.), . . . . ℥j.
M. For arthritis.

℞ Extracti opii, . . . . . . . . . . . . ʒss.
Cocainæ hydrochloratis, . . . . . . . . gr. x.
Mentholi, . . . . . . . . . . . . . gr. xv.
Ungt. zinci oxidi, . . . . . . . . . . ℥j.
M. Beneficial in anal fissure, rectal eczema and in hæmorrhoids.

The inhalation of steam impregnated with paregoric, or the watery extract of opium, is beneficial in acute pharyngitis. Ringer recommends the topical application of morphine dissolved in honey or glycerin, in order to relieve the throat-cough of phthisis. This solution or an opiated lozenge, is not without efficiency, even when the cough is entirely dependent upon the pulmonary condition. Gargles containing opium are often of benefit in the diseases named:—

℞ Tinct. opii camphoratæ,
Tinct. benzoini comp.,
Tinct. kino, . . . . . . . . . . . āā f℥j.
M. Sig.: Employ, diluted with water, as a gargle.

℞ Tinct. opii camphoratæ,
Aquæ menth. pip.,
Glycerini, . . . . . . . . . . . āā f℥j.
M. Sig.: Use as a gargle.

The oleate of morphine, with lanolin and a little chloroform, is a sedative application, or we may dissolve morphine in chloral-camphor and apply it over the site of pain. In various inflammatory conditions of the skin or conjunctivæ, fomentations with the recent decoction of poppy-heads is a soothing treatment, but is less anodyne and astringent than laudanum and hot water. Opium, morphine, or codeine may be introduced into the rectum in the form of suppositories, each containing 1 grain of the crude drug, or ½ grain of the extract, or of morphine or codeine, in painful conditions of the bowel and neighboring organs, and also, for its general effects, in producing sleep and quieting cough or restlessness. A warm bath and an opium suppository are of material value in relaxing the spasm which accompanies organic stricture of the urethra. These measures will frequently permit the escape of enough urine to cause considerable temporary relief in retention and, at the same time, facilitate the passage of a filiform bougie and catheter. An opium suppository often averts the chill which may follow instrumentation of the male urethra, quiets the nervous system after operations upon the female pelvis, and relieves the pain and tenesmus of cystitis and strangury.

Dr. von Klein, of Dayton, advocates the administration, in certain cases, of morphine by the nostrils. He states that, snuffed into the nose, this alkaloid is active in smaller doses than when given by the mouth, and that it is readily absorbed.

**Hypodermic Administration.**—Morphine is frequently injected hypodermically in order to produce its physiological effects, and the rule is to begin with a dose, at the most, only half as large as would be given by the mouth. Atropine is frequently combined with the morphine, and administered in this way to enhance its effect in treating neuralgia; they are also used in this combination (gr. $\frac{1}{4}$ and gr. $\frac{1}{120}$) previous to the use of chloroform, especially when a prolonged operation is anticipated. In cases of local pain, as first pointed out by Dr. Alexander Wood, of Edinburgh, who introduced the hypodermic method, there is an advantage in making the injection close to the spot affected, although, for a general anodyne or hypnotic effect, the skin on the arm or dorsum of forearm is generally selected. The rules for hypodermic medication may be briefly stated as follows:—

1. The instrument must be surgically clean and aseptic.
2. The solution used should be made with recently-boiled distilled water, or at least with recently-boiled water.
3. The patient should not be allowed to prescribe the injection, but it should be used only when, in the judgment of the physician, it is appropriate, necessary, and justifiable.
4. The spot selected should be cleansed, and the needle pushed through a fold of the skin pinched up with the fingers of the other hand to that holding the instrument, being careful in introducing it, to avoid proximity of veins. The desired amount being gradually injected into the loose cellular or muscular tissue, the needle is withdrawn, while with the finger pressure is made over the slight puncture and the fluid is gently dispersed under the skin.

It should be remembered that the morphine enters the circulation more quickly than when absorbed from the alimentary canal, and once injected cannot be withdrawn. In a strange patient, where idiosyncrasies are unknown, it would be wise to give not more than gr. $\frac{1}{10}$ to $\frac{1}{8}$, and watch the effects, repeating and increasing the dose if required. On account of the extreme susceptibility of young children to opium, the hypodermic method is considered inadvisable for them; and in elderly persons, or patients suffering with Bright's disease of the kidneys, it is used only with extreme caution.

**Special Applications.**—Opium is used symptomatically to relieve pain and irritation, to relax spasm, to produce sleep, to check secretions, and to influence nutrition. The preparations of opium and its salts are so efficient and convenient in the treatment of all forms of pain that the habit of indulgence is readily formed. It is therefore prudent for the physician not to inform the patient of what he is using, or to always give it in combination with other drugs. In some forms of brain disease, attended by congestion of the hemispheres, opium is inadmissible, especially in the form accompanying alcoholism. Meningitis, however, is benefited by opium, and in the cerebro-spinal form the deodorized tincture should be given in doses large enough to keep the patient from suffering. Professor Flechsig has formulated a method of treating epilepsy by an alternate use of opium and potassium bromide. Small doses of the extract of opium are at first given, but the quantity is gradually increased for about six weeks, when the patient is placed upon large doses of the bromide. This plan of treatment is said to be generally attended by good results and is thought to be especially applicable to juvenile patients. In biliary, renal, or intestinal colic, morphine, given by the mouth or hypodermically, is the most common means of relief; also in angina pectoris, palpitation of the heart, or cardiac dyspnœa. It must not be forgotten that, as pointed out by M. Huchard, the most important manifestation of angina pectoris is not the pain but the syncope with tendency to pulmonary œdema.

Small doses of opium—5 drops of the tincture, for instance—have an excellent stimulant effect in the case of a weak or dilated heart. In paroxysmal cardiac dyspnœa, as contra-distinguished from asthma and that due to pleural effusion, the hypodermic injection of morphine is followed by wonderfully good results, as pointed out by Allbut and confirmed by Ringer. Respiration becomes comparatively free, lividity disappears, and sleep is rendered possible. At first, $\frac{1}{6}$ grain twice or thrice a week is sufficient; subsequently it may be necessary to gradually increase the dose. This treatment more particularly applies to mitral than to aortic disease.

In bronchial and pulmonary affections, irritation of the sensory end-organs often excites cough, which is in excess of what is demanded for the expulsion of the inflammatory products from the air-passages. Moderate doses of morphine or opium, added to an expectorant mixture, restrain the cough of irritative origin, the irritation accompanying bronchitis being relieved by opium, and cough overcome so as to permit sleep; the secretions are also checked by it, so that it is a useful remedy especially in the declining stages of bronchitis, but a dangerous one in the early or congestive stage, where even a small dose may be fatal.

In bronchial asthma, opium alone or combined thus has a most decided action in giving relief and in assisting to check the morbid process:—

| | | |
|---|---|---|
| ℞ Tinct. opii, | | |
| Tinct. lobeliæ, | āā | fʒj. |
| Ammonii iodidi, | | ʒij. |
| Extracti grindeliæ robust fl., | | f℥ss. |
| Glycerini, | q. s. ad | f℥iv. |

M. Sig.: A teaspoonful three or four times a day or at any time during a paroxysm.

In pneumonia, opium is of advantage in relieving pain and excessive cough; here it is best given in the form of Dover's powder or in the following combination:—

| | |
|---|---|
| ℞ Antimonii et potassii tart., | gr. j. |
| Pulv. ipecac et opii, | gr. xl. |
| Potassii nitratis, | ʒj. |

M. Div. in chartæ no. xx.
Sig.: Take one every two hours, in pneumonia.

In pneumonia and pleurisy, when the pain is severe, opium may also be prescribed as follows:—

| | |
|---|---|
| ℞ Pulveris opii, | gr. iv. |
| Hydrarg. chloridi mitis, | gr. j. |
| Pulveris aromatici, | gr. xij. |

M. et ft. chartæ no. xij.
Sig.: A powder every half-hour or hour until relieved.

℞ Pulveris ipecac et opii,
Camphoræ monobromatæ, . . . . . . . āā ʒss.
M. et ft. capsulæ no. x.
Sig.: A capsule every half-hour or hour.

In typhus and typhoid fevers, small-pox, and other acute fevers, attended by poisoned blood and great delirium and restlessness, opium in appropriate doses at night will often be of great service in maintaining the strength of the patient. The above combination of tartar emetic and opium is extremely efficacious in those cases of typhus and typhoid fever characterized by furious delirium, insomnia, and exhaustion. In various other conditions the beneficial effects of opium are apparent. For instance, in rupture of the uterus, bladder, or intestines, in peritonitis, the only chance of recovery consists in keeping the patient fully under the sedative influence of opium, using the deodorized tincture in preference to any other form. In after-pains, in threatened abortion, in some cases of dysmenorrhœa, the judicious use of an opiate will afford immunity from suffering.

A hypodermic injection of morphine is of much service in ovaralgia, as in other forms of neuralgia. Another statement may be made here in regard to the efficacy of this mode of treatment in neuralgia generally, viz., not only is the attack temporarily relieved, but not infrequently the disorder is cured, or, at least, remains in abeyance for a considerable period. Cancer of the womb, or, indeed, malignant disease wherever seated, demands, almost without exception, the administration of some form or preparation of opium. Here, and, in fact, as in all essentially painful diseases, the remedy should be given with judicious boldness. Excessive pain requires full doses; smaller fail to relieve pain, increase nervous excitement, and are prejudicial rather than beneficial. In the treatment of cancer, there need be little or no fear of founding the morphine habit. Opium is useful in acute suppression of the menses when owing to moral or emotional excitement. Severe and deep burns are always marked by profound shock and excruciating pain, and in these conditions the hypodermic use of morphine is invaluable. Herpes zoster is another malady in which morphine, especially in union with atropine, is of notable service in relieving the violent, lancinating pain.

In cough mixtures, opium or morphine is a standard ingredient, but codeine has advantages when the cough is spasmodic and violent:—

℞ Codeinæ, . . . . . . . . . . . . gr. iij.
Tinct. belladonnæ, . . . . . . . . . fʒj.
Syr. pruni Virginianæ, . . . . . . q. s. ad f℥iij.
M. Sig.: Take a teaspoonful, when cough is annoying, four or five times daily.

In phthisis, the above formula will be useful in checking the cough at night and reducing tendency to night-sweats.

Codeine may be serviceably employed in acute and chronic bronchitis, whooping-cough, inflammatory conditions of the bowel or peritoneum, and in inflammation of the urinary passages. Its hypnotic and anodyne powers are decidedly less than those of morphine. It has been used with advantage in diabetes.

Opium is very serviceable in treating diabetes mellitus, and is preferable to codeine. Opium is, perhaps, the most efficient drug which we possess in the treatment of this disorder. It diminishes hunger and thirst, the quantity of urine excreted, and the amount of sugar eliminated. The progress of the disease is checked and the condition of the patient ameliorated. Large doses are required and well-borne in diabetes mellitus. The proper plan is to begin with moderate doses, and rapidly, but watchfully, increase according to the effect of the remedy upon the glycosuria, or until symptoms of narcotism make their appearance. Opium is also of service in diabetes insipidus, though less active than in saccharine diabetes.

In treating chronic ulcer, the administration of small amounts of opium several times daily will bring about a healthy condition and encourage healing. Given in larger quantities, 1 or 2 grains every three or four hours, opium is of equal value in the treatment of phagedæna, alleviating pain and checking the tendency to spread. This drug is beneficial in ulcerative stomatitis. Where there are excessive secretions opium will reduce them, as in bronchorrhœa, diarrhœa, dysentery, etc. In the diarrhœa of typhoid fever, opium may be judiciously and usefully employed, and it is often successful in controlling tuberculous diarrhœa. In various formulæ for cholera, opium holds a prominent place. In infants suffering with summer complaint, enterocolitis, or cholera infantum, all forms of narcotics are so dangerous as to be almost prohibited. The object of treatment is evacuation and disinfection of the intestinal tube, with administration of sterilized food; where this has been done, opium will generally not be required. In selected cases, however, it may be given in starch-water enemata (a drop or two of laudanum with 5 grains of chloral hydrate), in order to afford relief from restlessness and pain.

In the diseases previously referred to, opium is often so necessary in the treatment that we may append a few prescriptions containing this very important drug :—

| | | |
|---|---|---|
| ℞ Pulveris opii, | | gr. ss. |
| Pepsini sacch., | | |
| Bismuth. subnit., | āā | ʒss. |
| Ol. cinnamomi, | | ♏j. |

M. et ft. chartæ no. x.

Sig.: A powder every two or three hours for diarrhœa in children.

| | |
|---|---|
| ℞ Extracti opii, | gr. viij. |
| Pulv. ipecacuanhæ, | gr. xxiv. |
| Hydrargyri chloridi mitis, | gr. xvj. |

M. et ft. pil. no. xvj.

Sig.: A pill every hour or two for diarrhœa or dysentery in adults.

| | | |
|---|---|---|
| ℞ Tinct. opii camphoratæ, | | |
| Tinct. cardamom. comp., | | |
| Tinct. lavandulæ co., | āā | f℥j. |
| Aquæ menth. pip., | | f℥iij. |

M. Sig.: One tablespoonful every two or three hours for cramps and diarrhœa.

| | | |
|---|---|---|
| ℞ Tinct. opii, | | f℥ss. |
| Syrup. rhei aromatic., | | fʒij. |
| Tinct. cardamom. comp., | | f℥j. |
| Aquæ anisi, | q. s. ad | f℥v. |

M. Sig.: From one to two teaspoonfuls every two or three hours for diarrhœa of children.

℞ Tinct. opii,
Spiritus menth. pip.,
Spiritus camphoræ,
Tinct. capsici, . . . . . . . . . . . āā fʒj.
M. Sig.: Ten to forty drops every hour or two for diarrhœa with cramps.

℞ Tinct. opii,
Spiritus chloroformi,
Tinct. capsici,
Spiritus ammoniæ aromat., . . . . . . . āā fʒj.
M. Sig.: Twenty to forty drops every half-hour or hour for cramps attended with diarrhœa.

℞ Tinct. opii camphoratæ,
Mist. cretæ,
Tinct. kino, . . . . . . . . . . . āā f℥ij.
M. Sig.: From a half a teaspoonful to a tablespoonful every hour or two for diarrhœa.

Nausea and nervous vomiting are generally alleviated by the administration of opium. This remedy is useful in seasickness and the vomiting of pregnancy, in each of which it is apt to be more efficient if given subcutaneously. The same method is of value in obstinate hiccough. The pains of gastralgia, ulcer, and gastric carcinoma are amenable to the influence of opium, which is, furthermore, useful in ulcer in restraining hæmorrhage. There is a form of dyspepsia in which opium is of signal service. This is of an irritative character, occurs in thin people of an irritable, anxious temperament, and is indicated by a dry tongue, red at the tip and edges. Lead colic is lessened by opium. In acute obstruction of the bowels, due to spasm, $\frac{1}{2}$ grain of opium every four hours, for two or three days, will often relieve stercoraceous vomiting and permit normal evacuations. Even in fæcal impaction, good results have ensued from the daily injection of $\frac{1}{2}$ to 1 grain of morphine. This treatment is especially adapted to instances in which the gut has been injured by congestion or inflammation.* In chronic constipation, opium alone or combined with ipecacuanha often relieves the irritable bowel and assists in restoring tone and a healthy action to the mucous membrane. In gastritis, especially the acute variety produced by alcoholism, opium relieves pain and vomiting. The nervous manifestations of exophthalmic goitre sometimes receive benefit from opium.

The antispasmodic influence of this drug has been utilized in various convulsive affections. It is of undoubted service in severe cases of chorea in which twitchings abolish sleep, and it was given by Trousseau in large doses with good effects. The *petit mal* and nocturnal epilepsy are benefited by opium. Scanzoni and Loomis have amply demonstrated the safety and the value of hypodermic injections of morphine in uræmic coma. Although inefficiency of the eliminative organs ordinarily furnishes a contra-indication to the use of this remedy, yet in this alarming accident the morphine promotes the action of the skin and seems to exert a protective influence upon the nerve-centres. In tetanus, the deep injection of morphine into the affected muscles seems to be of some service. A hypodermic injection of morphine will frequently break up a spasm of asthma. Opium is of advantage in emphysema, hay fever, and the spasmodic stage of whooping-cough. Ten grains of Dover's powder alone, or, preferably, combined with an equal quantity of quinine sulphate, will abort a cold if given in its incipient stage. Morphine is a reliable stimulant in surgical shock and heat exhaustion; in both cases it should be administered hypodermically. In acute and chronic mania, and in melancholia, opium is capable, in selected cases, of affording decided benefit, especially in melancholia. Its administration in cases of alienation needs, however, to be directed with enlightened judgment. Dover's powder, in 10-grain doses, is often successful in checking the night-sweats of phthisis. The hypodermic injection of a small dose of morphine is of avail in hæmoptysis.

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* Phillips, *op. cit.*, p. 103.

**Apomorphinæ Hydrochloras** (U. S. P.).—Apomorphine Hydrochlorate. Dose, gr. $\frac{1}{16}$–$\frac{1}{4}$.

**Pharmacology and Therapy.**—Apomorphine is obtained by acting upon morphine by pure hydrochloric acid, 20 parts of the latter being added to 1 part of the former in a strong glass tube and exposed to a high temperature. Apomorphine hydrochlorate occurs in the form of colorless or grayish-white crystals, soluble in water and alcohol, almost insoluble in ether or chloroform.

According to the investigations of Reichert, toxic quantities of apomorphine give rise to convulsions followed by paralysis, chiefly of spinal origin. Medicinal amounts quicken and strengthen the pulse and increase arterial pressure. Poisonous doses cause rapid and irregular respiration. Apomorphine hydrochlorate is a systemic emetic and can be used hypodermically in the dose of $\frac{1}{8}$ grain to empty the stomach. In smaller doses it can be given as an expectorant in bronchitis. It is of value in the treatment of dry, hacking cough, attended with little or no secretion. As the result of a series of clinical experiments, Murrell* has ascertained that apomorphine, given by the mouth, is tolerated in much larger doses than had been supposed. He was able to administer 1, 1½, or even 2 grains, thrice daily without exciting nausea. In these quantities he found apomorphine hydrochlorate an excellent expectorant in chronic bronchitis, bronchorrhœa, and emphysema. Murrell usually prescribes the apomorphine in syrup of wild cherry, syrup of tar or of lemon. The addition of a few drops of nitro-hydrochloric acid to the mixture is advantageous. The same observer has employed apomorphine as a spray with very satisfactory results. He has frequently given as much as ½ drachm of a 1-per-cent. solution in a little water for each inhalation. A combination of apomorphine and morphine is valuable, and has been employed by Rossbach in phthisis. The cough becomes less frequent and the sputum more fluid.

Apomorphine hydrochlorate is often serviceable in the treatment of asthma, the writer prescribing it thus:—

| | | |
|---|---|---|
| ℞ Apomorphin. hydrochlorat., | | gr. ij. |
| Acid hydrochloric. dilut., | | f ʒ jss. |
| Morphinæ hydrochlorat., | | gr. j. |
| Syr. tolutani, | | f ℥ j. |
| Aq. chloroformi, | q. s. ad | f ℥ viij. |

M. Sig.: Half an ounce every third hour until dyspnœa is relieved.

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* "On the Action of Apomorphine and Apocodeine, with Reference to their Value as Expectorants in the Treatment of Chronic Bronchitis," by William Murrell, M.D., F.R.C.P., in the *Medical Bulletin* for March, 1891.

Digitalis or strophanthus may be combined with the above if there is any cardiac debility.

Apomorphine should not be continued too long, as it is liable to produce pulmonary œdema.

Dr. Alexander F. Samuels has written of the value of apomorphine in croup, giving $\frac{1}{48}$ grain in solution every five or ten minutes until vomiting is produced. If the child is unable to swallow, the remedy may be introduced beneath the skin. J. S. Horsley has found this alkaloid of service in controlling convulsions. He successfully employed hypodermic injections of $\frac{1}{15}$ to $\frac{1}{10}$ grain in a case of strychnine poisoning. This writer recommends apomorphine in the treatment of convulsions and minor phenomena of hysteria.

Apomorphine has been used on account of its depressant effects in maniacal delirium, hystero-epilepsy, chorea and persistent hiccough. It has been known to produce relaxation of a rigid os uteri.

**Apocodeine.**—Apocodeine is an amorphous brown powder, of an alkaline reaction, and soluble in ether, alcohol and chloroform.

The properties of apocodeine are similar to but weaker than those of apomorphine.

The physiological action of apocodeine has been lately studied by L. Guinard. According to this writer, apocodeine, has a hypnotic effect without causing nausea and vomiting. It increases reflex action, and in large doses occasions convulsions and tetanic spasms. In the opinion of Guinard apocodeine is not an emetic, and when it gives rise to nausea is probably contaminated with apomorphine. During the soporific action of this alkaloid the bodily temperature is reduced. Apocodeine always excites hypersecretion of saliva, bile, pancreatic and intestinal juices and increases intestinal peristalsis. The pupil is but slightly influenced during the sleep induced by apocodeine, but during the convulsive period it is widely dilated.

Dujardin-Beaumetz states that apocodeine has been found useful in hæmoptysis, croup, and whooping-cough, and recommends it in doses of $\frac{1}{4}$ grain hypodermically and $\frac{2}{3}$ grain by the mouth. Dr. Murrell has demonstrated that apocodeine hydrochlorate is beneficial in chronic bronchitis by virtue of its expectorant properties. He administered it by hypodermic injection, which produces no local irritation, provided the solution be neutral.

**Idiosyncrasy, Cautions as to Use of Opium, etc.**—Some persons are extremely susceptible to even minute doses of opium or morphine, being made very uncomfortable by it, and rendered wakeful and irritable, or annoyed by itching of the nose and eruptions upon the skin.

When this fact has been ascertained some other narcotic must be selected, because opium would be worse than wasted upon such a case. The family physician is expected to keep such an idiosyncrasy in mind when prescribing, and cases of this kind are not rare, by any means.

Flagg states that when opium, or any of its ordinary preparations, fails to produce a good effect, a solution of morphine bimeconate often acts well. This preparation, he adds, is an anodyne of decided efficacy where ordinary preparations of opium are idiosyncratically contraindicated. The dose is from 5 to 25 drops, as required.

Dr. Finney speaks favorably of the action of morphine hydrobromate. It generally, though not invariably, produces quiet sleep and relieves pain without being followed by the unpleasant effects which are sometimes caused by other morphine preparations.

When mothers are suckling their babes, opium should be given sparingly, if at all, because, being partly eliminated by the milk, it may narcotize the infant. As previously stated, infants are easily affected; and when children have coma or convulsions, *and the pupils are contracted*, the attendant may suspect that some one has administered an overdose of opiate to them. Narcotine has been successfully used as a substitute for quinine in the treatment of malarial fevers. Sir William Roberts testifies to its efficacy and states that in certain cases it proves curative after quinine has failed.*

The other alkaloids and constituents of opium are not used in medicine.

## ORIGANUM.—Origanum, Wild Marjoram.

**Dose**, ℨi–ij, in infusion or fluid extract.

**Pharmacology.**—Origanum vulgare (Labiatæ) is a small herb of Europe and the United States, with pale-purple flowers. It contains **volatile oil** (1 to 2 per cent.), with tannin, resin, and some bitter principle. It enters into aromatic wine. The oil is an aromatic stimulant, carminative, and counter-irritant.

**Therapy.**—Rarely used internally or externally; though formerly employed as a diaphoretic, emmenagogue, and stimulant tonic, or as a fomentation for bruises and sprains.

## ORTHOSIPHON STAMINEUS.—Java-Tea.

### *Preparation.*

*Extractum Orthosiphon Fluidum.*—Fluid Extract of Orthosiphon. *Dose*, ♏xx–xxx, largely diluted.

**Pharmacology.**—Orthosiphon stamineus (Labiatæ), or Java-tea, is a perennial plant from one to three feet in height, growing in India, the East Indian islands, Java and Australia. It contains a glucoside, which has been named **Orthosiphonin.** The leaves are the portion employed.

**Physiological Action and Therapy.**—This plant possesses diuretic properties, and has been found beneficial in diseases of the urinary tract. It has been given with good effect in gravel, pyelonephritis, and chronic cystitis, and is said to be serviceable also in gout. Dr. Frochard has reported a case in which this drug reduced ascites due to cirrhosis of the liver.

## OSMII PEROXIDUM.—Osmium Peroxide, Osmic Acid.

**Pharmacology.**—Osmic acid is the tetroxide of osmium. It forms colorless, acicular crystals, which sublime even at ordinary temperatures, and are easily fusible to a colorless liquid, with irritating vapor resembling chlorine, and capable of setting up inflammation of the eyes or of the air-passages.

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* See *British Medical Journal*, August 17, 1895.

**Physiological Action.**—In animals, osmic acid is actively poisonous in doses of only a few grains. A 1-per-cent. solution in water, or water and glycerin, is injected subcutaneously in man in the treatment of painful tumors and superficial neuralgia. No reaction, as the rule, follows these punctures, but sanguineous cysts and boils have been reported. A painful eruption upon the skin sometimes results from the application.

**Therapy.**—In some cases of neuralgia, the injection of a few drops of the centesimal solution deeply into the neighborhood of the nerve affected affords prompt relief to pain. It has also been applied to the skin in treatment of chronic indurated acne and some tubercular syphilides. Administered internally in epilepsy, in doses of gr. $\frac{1}{6}$ daily in pill form, it failed to have any decided beneficial effect in the hands of Dr. Schroeder* (*Inaug. Thesis*, *Univ. of Kiel*).

Dr. S. H. Auerbach reports a good result in a case of goitre from parenchymatous injection of a syringeful of a solution of osmic acid in the strength of 1 grain to 2 drachms of water. The injection was practised once a day or once in two days for three weeks. Local massage and the internal administration of potassium iodide were conjoined.

**PANCREATINUM** (U. S. P.).—**Pancreatin.**
**Dose,** gr. i–v.

*Preparations.*

*Extractum Pancratis.*—Extract of Pancreas. *Dose*, gr. i–v.

*Pulvis Pancreatini.*—Powdered Pancreatin. *Dose*, gr. v–x (usually mixed with powdered malt).

*Liquor Pancreaticus.*—Solution of Pancreatin. *Dose*, f℥ i–iv.

**Pharmacology and Physiological Action.**—Pancreatin is a digestive ferment obtained from the fresh pancreas, usually from the pig, resembling pepsin in origin, mode of preparation, physical characters, effects and therapeutic uses. Pancreatin contains an amylolytic ferment (similar to ptyalin or diastase); a proteolytic ferment (like pepsin, except that it is active in an alkaline medium) called **Trypsin**; a fat-emulsifier (like that found in bile); and a milk-curdling ferment (also present in calf-pepsin). The product may be obtained in the form of a powder for administration, like saccharated pepsin; but a better form would be in a recent solution made directly from the pancreas in diluted alcohol (the pancreas is minced or ground, thoroughly mixed and exhausted with water, strained, and diluted alcohol added to preserve it), this being known as liquor pancreaticus.

Pancreatin is an efficient digestive agent in an alkaline medium, thus differing from pepsin. It will peptonize milk, gruel, oysters, and many articles of food, thus rendering them more easily digested and more nourishing for the invalid. As it emulsifies fat, it will aid in the assimilation of codliver-oil and prevent its coming up in the throat. Trypsin will digest, and render soluble, mucous and fibrous deposits.

**Therapy.**—In diphtheria, a spray of trypsin, or of pancreatin solution, will dissolve the false membrane and favor its expulsion. A solution recommended for this purpose contains half a drachm each of trypsin and sodium bicarbonate with a drachm of glycerin to the ounce of water. Dr. Samuel Johnson recommends the addition to this solution of corrosive sublimate, ¼ grain to the ounce.[*] In hæmorrhage into the bladder, with the formation of clots, the deposit may be dissolved in the same manner as by the use of pepsin. If pancreatin be administered two hours after meals, it will assist intestinal digestion. It should be preceded by full doses of sodium bicarbonate, to insure an alkaline condition of the gastric contents. The pancreatin may be prescribed as follows :—

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* *Therapeutic Gazette*, November 15, 1889, p. 766.

℞ Pulveris pancreatini, . . . . . . . . . ʒj.
Hydrargyri chloridi mitis, . . . . . . . . gr. ij.
M. et ft. chartæ no. xij.
Sig.: A powder two hours after meals.

℞ Liquor. pancreatici,. . . . . . . . . . f℥iij.
Tinct. nucis vomicæ, . . . . . . . . . ♏c.
Glycerini, . . . . . . . . . . . . f℥ij.
M. Sig.: A tablespoonful after meals.

Pancreatin, or food predigested by its action, is available in cases of enfeebled digestion due to severe and prolonged illness and in wasting disease. Pancreatin is of particular value, as suggested by Boas, in cases marked by great diminution of the gastric secretion. It is of service in some forms of entero-colitis, in constipation and in diarrhœa with light-colored stools. It is frequently useful, moreover, in the vomiting of hysteria or pregnancy. This substance deserves trial in those cases of diabetes associated with disease of the pancreas. Pancreatin is particularly adapted for use in those diseases or conditions in which starch and fat are imperfectly digested. It is of service also, added to nutrient enemeta, in cases where the stomach cannot retain or digest food. It may be used in the same manner in stricture of the œsophagus. Its alkaline reaction favors its efficiency.

## PAPAIN, or PAPAYOTIN.—Papoid.

**Dose,** gr. i–v.

**Pharmacology and Physiological Action.**—The Carica papaya (Papayaceæ), or papaw-tree, is a native of tropical America. The tree grows without branches to the height of twenty or twenty-five feet and is crowned by long, large, palmate leaves. It bears a large melon-shaped fruit, of a yellow color when ripe and containing many seeds. In the trunk, leaves and fruit is found an abundance of milky juice, from which Wurtz, of Paris, isolated a peculiar ferment capable of rendering albuminous substances soluble. The attention of the profession was called to this new digestive agent by Dr. Finkler, of Bonn.[†] Papain converts albuminoids into peptones, starch into maltose and emulsifies fats. It has antiseptic virtues and prevents abnormal fermentation within the stomach and bowel. Papain can be administered in conjunction with salol or a weak solution of corrosive sublimate without loss of its peculiar virtues. It has no action upon living tissues and is harmless in any dose that is likely to be given. Its digestive power is greater than that of pepsin or pancreatin. According to Herschell it exerts a direct influence upon the stomach and stimulates the secretion of gastric juice. Papain is soluble in water, though not in alcohol, but is active in either an acid or alkaline solution, and is more energetic than pepsin in dissolving false membranes.

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[*] *Journal of the American Medical Association*, July 29, 1893.

[†] Papain Finkler is sold in this country under the name of "Papoid." See article on "The Digestive Ferment of the Carica Papaya in Gastro-Intestinal Disorders," by Prof. Frank Woodbury, *New York Medical Journal*, July 30, 1892.

Recently Woodbury has published an article * stating that Señor Marcano, of Bolivia, has found that a similar ferment, **Bromelin**, exists in pine-apple and other plants of the natural order Bromeliaceæ, and has applied it to the peptonizing of meat on a large scale, making a preparation of powdered beef, which is very easily digested, and the proteid matter of which consists of 50 per cent. of peptones. It is known as the Mosquera-Julia Beef-Meal, for which Parke, Davis & Co. are the agents for the United States. The juice of the fig and many other plants possess slight digestive powers, as beautifully shown in the well-known Dionæa, or Venus' fly-trap, and other members of the Drosera family, which Darwin found to secrete an acid juice which would digest small pieces of meat.

An aqueous solution of papain soon spoils, but dissolved in glycerine it will keep for an indefinite period. It is best given, however, in powder or made into tablets.

M. Greshoff, has extracted from papaw-leaves an alkaloid which he terms carpaine. It forms large colorless crystals, readily soluble in chloroform and absolute alcohol, but much less soluble in ether, and insoluble in water. The hydrochlorate of this base is readily soluble in water, acts especially upon the heart, the movements of which it retards, and proved fatal to a fowl in the dose of 3 grains. Carpaine is crystallizable and very bitter. Von Oefele states that it does not cause irritation or suppuration when hypodermically injected. It has been used as a substitute for digitalis in doses from $\frac{1}{10}$ to $\frac{1}{6}$ grain daily for injections, or as high as $\frac{1}{3}$ grain by the mouth.

**Therapy.**—Papain has been used to dissolve the false membranes in diphtheria and croup, by the spray and by a camel's-hair brush dipped in aqueous solution (gr. xxx or ʒi–f℥j). Though it accomplishes this useful purpose, it has no power to prevent fresh formation of the membrane, and must, consequently, from time to time, be re-applied. An alkaline solution of papain has been found beneficial in fissures and ulcers of the tongue. A paint containing 50 grains of papain and 25 grains of borax to the ounce of water has been used with success in the treatment of warts and eczema squamosum chronica. Papain dissolves intestinal worms. It has also been injected into the interior of tumors to promote absorption.

The late Dr. E. A. Wood, of Pittsburgh, employed papain, dissolved in glycerin, as a spray in ozæna, tuberculous ulcers of the larynx and the cavities of pulmonary tuberculosis. He wrote that in eight months of trial he had been " more and more convinced of its efficiency in the lesions named."

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* "On the Use of Nitrogenized Food in Fever and Wasting Diseases," *Therapeutic Gazette*, December, 1890, p. 811.

In the various forms of dyspepsia, papain has been employed with good effect. Grineritshi recommends papain (*Bull. Gén de Thérap.*) in habitual indigestion attended with acid eructations, painful symptoms of gastric fermentation, and constipation. He uses 2 grains of this drug in sugar of milk an hour or two after taking food. The following combination is suggested :—

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|---|---|
| ℞ Papaini, | ʒss. |
| Liquor. ammonii acetatis, | f℥ij. |
| Creosoti, | ♏v. |
| Glycerini, | f℥ij. |

M. Sig.: Two teaspoonfuls an hour or two after taking food.

Galactagogue virtues have also been ascribed to papain. This remedy is of value, moreover, in diarrhœa dependent upon indigestion. The suggestion has been made that it would also answer a good purpose as a solvent of cerumen.

Dr. Woodbury has had excellent results from the use of a compressed pill of papain, sodium bicarbonate and extract of nux vomica. This writer recommends papain in cases of deficient secretion of the peptic glands, a diminution of hydrochloric acid or pepsin, excess of hydrochloric acid, in gastralgia, nausea, gastric and gastro-intestinal catarrh, diarrhœa due to indigestion, etc. Sittmann has known papain to give rapid relief in acute gastritis. He witnessed improvement, likewise, in a chronic case of indigestion where an ulcer had undoubtedly existed at some period. In carcinoma of the pylorus this remedy gave marked relief. In dilatation of the stomach the use of papain is productive of decided benefit. In some cases the improvement has been so great that washing out the organ became unnecessary. In one case it was observed that the stomach diminished in size.

Papain has not been much used as a substitute for pepsin or pancreatin on account of its much higher cost, but it is probable that this may be overcome in time, and that a pure vegetable digestive agent of superior activity to pepsin, and possessing the advantage of being efficient in an alkaline as well as an acid medium, may be supplied at a reasonably low price.

**PARALDEHYDUM** (U. S. P.).—**Paraldehyde.**

**Dose,** ♏xx–fʒij.

**Pharmacology.**—Paraldehyde, chemically, is a polymeric form of ethylic aldehyde, produced by the action of a trace of sulphuric acid, or of zinc chloride, on aldehyde. It is a colorless, mobile liquid, dissolving in eight volumes of cold water, is less soluble in hot water, but dissolves freely in alcohol and ether. Paraldehyde crystallizes below 50° F. and boils at about 225° F. It has a burning, unpleasant taste and a penetrating ether-like odor. It may be given with syrup and a vegetable bitter, or with an ounce of aromatic water.

**Physiological Action.**—A hypnotic agent, exercising no depressing effect upon the heart in ordinary doses and causing no headache or disturbance of digestion. Paraldehyde is a good substitute for chloral, especially in low fevers or where the heart is weak. It is also diuretic, but not diaphoretic. The solid constituents of the urine, it is said, are not increased, though, in the case of three boys to whom paraldehyde was experimentally administered, Gordon found a marked increase of urea. According to the writer just quoted, paraldehyde facilitates the digestion of fibrin. This substance is possessed of antiseptic properties. Death, preceded by unconsciousness and coma, has been caused by a dose of 6 or 7 drachms in a patient suffering with typhoid fever (*Lancet*, August 20, 1890). A case has been reported in which 3½ ounces caused unconsciousness and profound muscular relaxation. The patient remained unconscious for thirty-four hours, but recovered by the aid of strychnine hypodermically, electricity and stimulation. Dr. Frederic Peterson, of New York, mentions a case of paraldehyde habit in which a woman had taken ounce-doses nightly for months without any harmful result. On the contrary, bad effects have been seen in consequence of a 2-drachm dose taken for the first time. It is judicious to begin with small amounts. The fatal result from a toxic dose is attributed to its action upon the respiratory centre. Its principal influence is upon the cerebrum. In some cases, it has been accused of producing albuminuria, but this might be explained by the presence of cirrhotic kidneys, with transitory attacks of albuminuria. Paraldehyde is very rapidly absorbed, and is eliminated by the lungs, its odor having been recognized in the breath twenty-four hours after administration. Paraldehyde is also eliminated by the kidneys and communicates its characteristic odor to the urine.

Paraldehyde is a physiological antidote to strychnine.

**Therapy.**—Bright's disease does not prohibit the use of paraldehyde. In such cases, where insomnia is persistent, the dose should be ♏xxx–xl to commence with, given at the bed-hour, and cautiously increased to a drachm if necessary. In the irritability, restlessness, and insomnia attending heart disease, 20 drops may be given every four hours, with large doses at night, with marked benefit. In bronchitis, pneumonia, and headache, paraldehyde is generally less useful than chloral hydrate and bromide, but in phthisis with persistent insomnia, in 40-minim doses at bed-time, it produces a natural sleep lasting twelve hours. Some patients, however, complain of headache next day and persistent drowsiness, so that it soon has to be discontinued. Paraldehyde is, perhaps, particularly applicable to wakefulness associated with psychical disturbances. Very favorable accounts have been given by various observers of its beneficial influence in the cerebral manifestations of hysteria, in mania, melancholia, and the general paralysis of the insane. Paraldehyde is the preferred hypnotic* in the neurological clinic at Dorpat. It seldom fails to produce a good night's sleep; though, in some instances, tolerance is soon established. It may give rise to indigestion and diarrhœa, but its use is not followed by headache and depression. Paraldehyde has the disadvantage of communicating to the breath an unpleasant odor which may persist for hours or even days. Dr. J. G. Kiernan has known the continued employment of paraldehyde to occasion obstinate ulcers of the nose and eruptions upon the skin.

It has been used with advantage in delirium tremens, morphinism, and epilepsy. Several cases have been reported in which tetanus was cured by paraldehyde, which allayed the convulsions, diminished the pain and relieved the insomnia. According to Dr. William Mackie, paraldehyde is beneficial in spasmodic asthma. Dr. Humphrey has witnessed decided improvement in the character of the respiration in broncho-pneumonia follow the administration of this remedy.

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* "The Hypnotic Efficiency of Paraldehyde," *New York Medical Journal*, November 29, 1890.

Paraldehyde, in order to disguise its unpleasant taste, may be administered as follows:—

| | |
|---|---|
| ℞ Paraldehydi, | f℥ss. |
| Olei gaultheriæ, | ♏x vel xx. |
| Pulveris acaciæ, | ʒij. |
| Syrupi pruni Virginianæ, q. s. ad | f℥iv. |

M. et ft. emulsio.

Sig.: A half to a tablespoonful in water every hour or two. Use as a hypnotic, or to lessen bronchial or pulmonary irritation.

Dr. R. G. Eccles suggests the following as a good method of administration:—

| | |
|---|---|
| ℞ Paraldehydi, | fʒij. |
| Chloroform., | ♏x. |
| Olei cinnamomi, | ♏ij. |
| Olei amydal. dulc., | fʒij. |

M. Sig.: Mix and take undiluted.

With the combined administration of caffeine (4 to 8 grains daily) and paraldehyde (30 to 45 drops at night), Cevello found, in cases of œdema, ascites, and pleuritic effusion, that the amount of urine was greatly increased. A case has been instanced of senile arterial depression accompanied by dejection, restlessness and insomnia, and in which extensive valvular disease of the heart was also present. Paraldehyde had an excellent effect upon the restlessness and insomnia, and when cardiac compensation began to fail it also rapidly reduced the dropsy.

**PAREIRA** (U. S. P.).—**Pareira, Pareira Brava.**
**Dose,** ʒss–j, in infusion (1–17) or fluid extract.

### *Preparation.*

*Extractum Pareiræ Fluidum* (U. S. P.).—Fluid Extract of Pareira. *Dose,* fʒss–j.

**Pharmacology.**—The root of Chondodendron tomentosum (Menispermaceæ) is official as Pareira; products of allied genera also appear in commerce under the name of "false Pareiras." It is a climbing, woody vine of Brazil, where it is extensively used as a medicine. Pareira contains **Buxine,** a bitter, somewhat tonic alkaloid; found also in false pareiras and other plants occasionally employed in medicine. Buxine is identical with the beberine of Nectandra, and is the active principle of boxwood; it has also been known as "pelosine," or "cissampeline."

**Physiological Action.**—Pareira is slightly tonic, but is esteemed principally as a diuretic and laxative, though, probably, without much reason.

**Therapy.**—It is principally used in fluid extract, decoction, or infusion, with alkalies, in the treatment of irritable bladder, cystitis, pyelitis, chronic urethritis, and leucorrhœa. In South America it is given for snake-bite, and applied externally to the wound.

### PAMBOTANO.

**Dose,** ʒi–ij.

**Pharmacology.**—Pambotano, or Calliandra Houstoni, a Mexican shrub which grows to the height of three or five feet, has a local reputation, but was first brought prominently into notice by Dr. J. Valude. A chemical analysis of the plant by Dr. Villejean revealed the presence of a peculiar tannin which forms a dark-green precipitate with ferric chloride. The drug was administered by Dr. Valude in the dose of 2½ ounces to an adult, and 1 ounce to a child less than twelve years of age. A decoction or alcoholic elixir containing the dose was divided into four portions and taken within the twenty-four hours. It is advised that the liquid should be taken hot.

**Therapy.**—Pambotano has been almost exclusively used as a remedy in malarial fevers, as a substitute for quinine, in cases uninfluenced by the latter drug. Successful results were obtained in many cases by Valude, Bandera, Betances, Pellatan, and other observers, in Mexico, Central America, and Rome. A series of eight cases was treated by Dr. A. E. Roussel, of Philadelphia, by means of pambotano, with results which were decidedly encouraging, though not so brilliant as some of those reported from foreign sources. In two cases no improvement seemed to be produced, the failure being possibly due to rejection of the remedy by the stomach. Gastro-intestinal irritability is frequently caused by pambotano. Experiments were made by Dr. Roussel with pambotano in influenza, typhoid fever, and phthisis, but no influence could be detected upon the course of these maladies.

Pambotano is reported to be also beneficial in diarrhœa, dysentery, leucorrhœa and in certain diseases of the eye, as opacities of the cornea.

### PENTAL.—Trimethyl-ethylene.

**Dose,** fʒii–iij, by inhalation.

**Pharmacology.**—Under the name of pental (because it contains five atoms of carbon) von Mering has introduced a compound made by heating tertiary amyl alcohol with oxalic acid. Pental is a colorless liquid, of low specific gravity and strong odor, is volatile and inflammable, boils at 100.4° F., and is insoluble in water. It mixes in all proportions, with alcohol, chloroform, or ether. It does not decompose on exposure to light and air.

**Physiological Action.**—When inhaled, a loss of sensibility occurs within two or three minutes without entire abolition of consciousness. Profound narcosis may, however, be produced by means of pental. The return of consciousness is gradual. This agent is unirritant to the respiratory tract, and no ill effects upon the circulation or respiration have, as yet, been reported. As a rule, no excitement is caused, but in some instances laughter, hallucination, or transient spasm has occurred.

From a series of physiological experiments upon dogs, Dr. David Cerna concludes that pental causes a fall of arterial pressure and of the pulse-rate, and produces death mainly by cardiac paralysis. Recovery from its anæsthetic effects was often accompanied by wild excitement. He does not regard it as a safe or even efficient general anæsthetic. Pental rarely gives rise to headache or vomiting. The conjunctival reflex is late in disappearing, and, except fixation of the eyes, no marked change takes place in the color or expression of the face. The pupils are sometimes widely dilated. Pental may be administered upon a handkerchief or by means of an inhaler, and 2 or 3 drachms usually suffice to produce anæsthesia.

**Therapy.**—Pental has been employed in the operations of dentistry and minor surgery. Hollænder and Weber have used it with satisfaction and success in the extraction of teeth, opening of abcesses, etc. Teeth may be painlessly drawn while the patient is partially conscious. Pental has been used in a large number of cases in the Kaiser und Kaiserin Friedrich's Children's Hospital of Berlin, without dangerous accidents or after-effects. From other sources, however, a number of deaths have been reported as caused by this agent. In a number of cases, moreover, Kleindienst detected albumin, blood, and casts in the urine after the administration of pental. Some patients have been observed in whom it proved impossible to produce anæsthesia by means of this agent. Alarming cyanosis, dyspnœa and cardiac debility are sometimes caused by pental, and in a number of instances death has taken place from the inhalation of small quantities.

**PEPO** (U. S. P.).—**Pumpkin-Seed.**

**Dose,** ʒi–ij.

**Pharmacology.**—The seeds of Cucurbita pepo (Cucurbitaceæ), or pumpkin, contain a resin, an alkaloid, **Cucurbitine,** oil, starch, sugar, etc. The seeds are crushed and beaten into a paste with milk and white sugar, and the resulting emulsion strained ; or the seeds may be decorticated first and the contents rubbed up with sugar and milk, or sugar and water.

**Therapy.**—The principal medicinal use of pepo is for destroying tape-worms. It is generally efficient, cheap, and not very difficult to take. A preliminary purge of calomel should be given in the morning and the emulsion swallowed fasting at night. In the morning, a laxative (castor-oil, Rochelle salt, etc.) is administered, and the tape-worm is discharged, with the head. It is said that the resin (in doses of gr. xv) or the fixed oil (in doses of f℥ss) are also efficient when administered in the same manner. The combination of oleoresin of aspidium (or male fern) is very serviceable in destroying the tape-worm :—

| | |
|---|---|
| ℞ Oleoresinæ aspidii, | fʒj. |
| Chloroformi, | ♏x. |
| Emulsion. peponis, | f℥xij. |

M. Sig.: To be divided into two doses, to be taken one hour apart, and followed by castor-oil an hour later.

**PEPSINUM** (U. S. P.).—**Pepsin.**

**Dose,** gr. j–iij.

*Preparations.*

*Pepsinum Saccharatum* (U. S. P.).—Saccharated Pepsin. *Dose,* gr. v–xxx.

*Liquor Pepsini.*—Solution of Pepsin (saccharated pepsin 40, hydrochloric acid 12, glycerin 400, water q. s. ad 1000 parts). *Dose,* f℥ss.

*Pepsinum Purum in Lamellis.*—Pepsin in Scales, Pure Pepsin. *Dose,* gr. i–ij.

*Vinum Pepsini.*—Wine of Pepsin. *Dose,* fʒi–ij.

*Glycerol Pepsini.*—Glycerol of Pepsin. *Dose,* ♏x–xxx.

*Vinum Pepsini Seriparum.*—Rennet-Wine. *Dose,* fʒj–℥j.

*Glyceritum Pepsini Vitulini.*—Glycerite of Calf-Pepsin. *Dose,* fʒi–iv.

**Pharmacology.**—Of the numerous methods proposed for obtaining for medicinal use the digestive ferment from the gastric mucous membrane of certain domestic animals (hog, calf, sheep, principally) the most prominent are (1) scraping the acid mucous secretion from the surface of the stomach, spreading on glass and drying in scales (Beale); (2) extracting by maceration in acidulated water and precipitation with alcohol or lead acetate, and (3) by precipitation with sodium chloride (Scheffer). **Saccharated pepsin** is pepsin obtained from the gastric mucous membrane of the hog, mixed with sugar of milk. It is a white powder, of a peculiar but not disagreeable odor and taste, and a slightly acid reaction. **Liquor pepsini**, or solution of pepsin, is an acidulated solution of the preceding, containing glycerin (40 per cent.). It is an artificial gastric juice, with an agreeable, acidulous taste; it should not become mouldy, nor acquire a fetid odor when kept for some time. Many kinds of pepsin are upon the market, varying greatly in purity and digestive activity. Those containing a considerable quantity of mucus, which have a strong odor of the pig-sty, and which do not prove to have digestive activity when tested with boiled egg-albumin, should be rejected. Under comparative tests made by Professor Chittenden not long ago, the *pepsinum purum in lamellis*, made by Parke, Davis & Co., was found to have the greatest digestive power and to be the purest in the market. The glycerole of pepsin, made by the same house, is also a very active preparation. The pepsin preparations of Messrs. Fairchild Bros. & Foster, of New York, are likewise active and acceptable agents, and are very largely used. Pepsin requires an acid medium in order to exert its digestive power upon albumin, while trypsin, or pancreatin, is active in a neutral or alkaline solution. On account of its instability, pepsin is best given uncombined. The substances with which it may be safely prescribed are few in number. As it is only active in an acid fluid it should not be conjoined with sodium bicarbonate.

**Physiological Action.**—Pepsin is a constituent of normal gastric juice, associated with hydrochloric acid. It is a complex, albuminous substance, capable of causing changes in other albuminoids by a process similar to fermentation, or catalysis, converting them into peptones or albumoses. It also converts blood-coagula, fibrin, etc., from the solid to the soluble or liquid state. It is an unorganized ferment, peculiar to gastric juice of the higher animals, although similar ferments have been discovered in carnivorous plants, and in the paw-paw, pine-apple, etc. Alcohol precipitates pepsin, and, even in dilute form, checks its activity. Alkalies and some mineral salts also precipitate it.

**Therapy.**—Pepsin, in concentrated solution, may be locally applied to digest blood-clots in the urinary bladder; and, in atomized solution or spray, to dissolve the false membrane in diphtheria and croup. In the former affection the diphtheritic membrane may be treated with this solvent, containing pepsin:—

℞ Pepsini puri (in lamellis), . . . . . . . ʒij.
Acidi hydrochlorici dil., . . . . . . . ♏x.
Aquæ menth. pip.,
Glycerini, . . . . . . . . . āā f℥ss.
M. Sig.: Paint over the surface several times a day.

A 5-per-cent. solution of scale-pepsin, in lanolin, is a useful application to clean off old ulcers. Morris recommends a 10-per-cent. solution, acidulated with 1 per cent. of hydrochloric acid and heated to 100–120° F., for washing out abscess cavities, etc. In connective-tissue tumors of non-malignant character pepsin may be used by the parenchymatous injection to promote absorption. Mr. John Clay has seen good results follow the application of pepsin to cancer of the cervix uteri. He states that much of the neoplastic tissue may be destroyed, and that in some instances an apparently sound surface is obtained. The chief use of pepsin is to aid weak digestion, and it is invaluable in atonic dyspepsia, especially following acute diseases. While the stomach should not be expected to depend entirely upon outside sources for its gastric juice, yet, in conjunction with hygienic treatment, the temporary resort to pepsin is followed by the best results. Given in this manner pepsin acts, in fact, as a true stimulant to the gastric glands and promotes their functional energy. In chronic maladies, such as anæmia, chlorosis, diabetes, tuberculosis, and carcinoma, the administration of pepsin is of service by promoting nutrition. In malnutrition, foods may be partly peptonized previous to administration, thus saving time in stomach digestion. The use of peptonizing tubes, each containing sufficient for a pint of milk, is of great assistance in preparing such food, especially in the case of infants. In irritable stomach, pepsin acts as a sedative, and may be given in conjunction with bismuth subnitrate or minute doses of calomel:—

℞ Pepsini puri (in lamellis),
Bismuth. subnit., . . . . . . . . . āā ʒj.
Olei cinnamomi, . . . . . . . . . . ♏xij.
M. et ft. capsulæ no. xij.
Sig.: A capsule after meals.

℞ Hydrarg. chlor. mitis, . . . . . . . . . gr. j.
Pepsini saccharati, . . . . . . . . . . ʒj.
Pulv. myristicæ, . . . . . . . . . . gr. iv.
M. et ft. chart. no. xij.
Sig.: Take one every half-hour to relieve nausea and vomiting.

Pepsin is also useful in gastralgia, pyrosis, gastric catarrh, and apepsia of infants. In gastric cancer or simple ulcer, feeding may be carried on by the rectum, provided some pepsin be added to the nutritive enemata. But this remedy, when given by the mouth, is frequently of value in relieving the vomiting due to ulcer or cancer of the stomach. Sickness of the stomach, produced by indigestion, is generally relieved by pepsin, which is sometimes able, also, to allay the vomiting of pregnancy. Infantile diarrhœa, excited by the presence of undigested food in the intestinal tube, is markedly benefited by the administration of pepsin. The most satisfactory shape in which to administer pepsin is in its pure form, as the saccharated pepsin is too weak to have much digestive power:—

℞ Pepsini puri (in lamellis), . . . . . . . . ʒj.
Ext. nucis vomicæ, . . . . . . . . . . gr. v.
Pulv. ipecac., . . . . . . . . . . . . gr. ij.
Pulv. aromat., . . . . . . . . . . . gr. xv.
M. et ft. pil. vel. capsulæ no. xxx.
Sig.: Take one immediately after meals for atonic dyspepsia.

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|---|---|
| ℞ Glycerol. pepsin., | f℥j. |
| Acid. hydrochlor. dilut., | fʒj. |
| Aquæ anethi, | f℥iss. |

M. Sig.: Take a teaspoonful after meals for indigestion.

| | |
|---|---|
| ℞ Pepsini puri (in lamellis), | gr. cc. |
| Strychninæ sulphatis, | gr. ¼. |
| Aloini, | gr. ij. |
| Ol. menth. pip., | ♏j. |

M. et ft. capsulæ no. xx.

Sig.: A capsule after meals. For atonic dyspepsia accompanied by constipation.

**Rennet-wine** is obtained by macerating calves' stomachs in sherry or other light wine. It is useful in apepsia in infants; but the glycerite of calf-pepsin is a more active and efficient preparation.

**PERSIA.—Cudbear.**

**Pharmacology.**—A dark, purplish powder, prepared from certain lichens (**Lecanora tartarea,** and other species). It yields a coloring matter to alcohol, and is principally used in dyeing. The tincture of cudbear is used as a coloring agent for liquids.

**PETROLEUM.—Rock-Oil.**

*Preparations.*

*Petrolatum Molle* (U. S. P.).—Soft Petrolatum. A semi-solid substance, consisting of hydrocarbons, chiefly of the marsh-gas series, obtained by distilling off the lighter and more volatile portions from petroleum and purifying the residue.

*Petrolatum Liquidum* (U. S. P.).—Liquid Petrolatum.

*Petrolatum Spissum* (U. S. P.).—Hard Petrolatum.

*Rhigolenum.*—Rhigolene. Used with atomizer to anæsthetize a part by cold.

*Benzinum.*—Benzine. *Dose,* ♏x–xxx, in mucilage or capsule.

**Pharmacology.**—Petroleum is a very complex fluid, of natural origin, known from time immemorial, and found in various regions of the Old and New World. In this country the principal source of supply is the wells of Pennsylvania, though it exists abundantly in Ohio, Western Virginia, and Kentucky. Crude petroleum, though occasionally clear, usually presents a greenish tinge. Its specific gravity varies from 0.865 to 0.777. Petroleum consists chiefly of two homologous series of isomeric hydrocarbons, at one extremity of which marsh-gas is found and solid paraffin at the other. It is not a fluid of definite composition or fixed boiling-point. American petroleum consists chiefly of paraffins. Barbadoes tar, Seneca oil, and Rangoon oil are thick varieties of petroleum. The Rangoon oil contains a larger proportion of both the olefine and the benzole series than American oil. Oxygen, nitrogen, and sulphur have been found in certain varieties of petroleum, but are present as impurities, though, according to H. Vohl, all kinds of petroleum contain sulphur.

Petroleum does not saponify. It is soluble in ether, but nearly insoluble in chloroform; it is a solvent for caoutchouc and many resins. By fractional distillation and purification, it yields a number of commercial products, the lighter oils being used as solvents, the heavier for illumination, fuel, and various mechanical purposes.

Naphtha, a name which was formerly applied to the lighter varieties of crude petroleum, is now used to designate all that portion which distills over at or below 122° F. By repeated fractional distillations the most volatile hydrocarbons are obtained from naphtha. **Benzine** consists of the more volatile portions, being very inflammable, and yields vapors, which, if combined with air, are explosive. Coal-oil for illuminating purposes consists of less volatile hydrocarbons, which should not evolve explosive vapors under 110° F., and the better oils require 150° or over.

Petrolatum, petroleum-jelly, or petrolatum ointment, is a semi-solid substance, consisting of hydrocarbons, chiefly of the marsh-gas series ($C_{16}H_{34}$, etc.), obtained by distilling off the lighter and more volatile portions from American petroleum and purifying the residue. It is an amorphous, pale-yellowish, odorless, tasteless, or nearly so, transparent, fatty substance, in thin layers more or less fluorescent. Petroleum is insoluble in water, scarcely soluble in cold absolute alcohol, soluble in 64 parts of boiling absolute alcohol, soluble in ether, chloroform, fixed and volatile oils. Petrolatum is commonly sold as cosmoline, vaseline, aboline, etc. It does not become rancid, and is used as a basis for ointments as a substitute for lard. It can also be obtained as a liquid oil. The properties and actions of benzine have already been described.

**Physiological Action.**—Petroleum possesses decided antiseptic power, is stimulant, and, taken internally in small quantities, is antispasmodic, diaphoretic, and expectorant. It disinfects the gastro-intestinal and respiratory mucous tracts. In large doses it gives rise to headache, vertigo, pain in the throat and stomach, palpitation of the heart, vomiting, and tetanic spasm.

**Therapy.**—Rock-oil enjoys considerable popular repute both as an internal and external remedy. As a counter-irritant it is used in chronic rheumatism, synovitis, sprains, chilblains, and paralysis. It is likewise applied to the neck or chest for inflammatory affections of the throat and air-passages. Petroleum is a beneficial application in diphtheria. It may be painted upon the affected surface with a camel's-hair brush or by means of a pledget of absorbent cotton. Patients who are old enough may also use it as a gargle. The false membranes are reproduced, but are much smaller and thinner than before the application. Mr. Sydney Turner, of Gloucester, England, suggests also that petroleum be vaporized in the room occupied by patients suffering from diphtheria. Larcher has employed this agent in a series of forty-two cases with only two deaths and without an instance of communication of the disease to any other person. Of the fatal cases one was moribund when first seen and in the second his directions were not obeyed.

Crude petroleum is useful in certain forms of conjunctivitis. It is a painless application and is well borne by the cornea. In granular conjunctivitis it may be rubbed upon the affected surface with a toothbrush. Petroleum is useful in ordinary catarrhal conjunctivitis and in follicular ophthalmia. It is of service in some cases of trachomă while in others it fails.

Petroleum, alone or combined with other drugs, has been employed in psoriasis, eczema, seborrhœa, scabies, and almost every variety of skin disease. In eczema, Kaposi recommends the following:—

℞ Petrolati,
Emplast. plumbi, . . . . . . . . . . āā ℥ss.

Dissolve and thoroughly incorporate with the aid of heat, and add a little oil of bergamot to flavor, if desired.

Sig.: Apply to the affected surface on soft cotton or linen.

Desprès advocates the use of petroleum as an application to ulcerated carcinoma of the breast. In uterine cancer he has found that vaginal injections of 3 or 4 ounces of petroleum answer a good purpose. He recommends the same procedure in acute vaginitis.

The stimulating properties of petroleum render it of service in loss of hair and alopecia circumscripta. Petrolatum has been widely employed as an unguent, and as a basis with which to incorporate more active topical medicaments. It is cleanly, devoid of odor, is not subject to alteration, and is available when the object is solely to cover the integument with a bland protective layer. It frequently happens, however, that petrolatum contains irritant constituents which have not been removed in the process of manufacture, and which render this substance useful as a stimulant ointment.

When it is desired that a fatty material should penetrate the skin, one of the animal fats—as lard, suet, butter, or lanolin—is entitled to the preference as an ointment base.*

Liquid petrolatum is available as an application for bougies, catheters, and other instruments. It has also been employed, by means of the atomizer, in inflammatory conditions of the nares, and after operations upon these and other parts of the body. Liquid petrolatum has also been used as a menstruum for suspending various substances in it, for external and internal use. Some clinicians have been incorporating certain of the mercurial salts in liquid petrolatum, and employing the combination for hypodermic injections into the tissues.

Internally, the crude oil has been given, in the oil regions, in teaspoonful doses to children suffering with croup and whooping-cough, with asserted good results. It is occasionally given in chronic bronchial and pulmonary disorders with advantage.

Petroleum, administered by inhalation and internally, has been strongly recommended as of value in pulmonary tuberculosis.

It is employed in Germany as a vermifuge, dose 20 to 30 drops. The finer qualities of petroleum have been given with success in cholera in doses of 10 to 20 drops in mint-water or white wine.

The vapor of naphtha has some irritating qualities to mucous membranes, and produces œdema of the eyelids. In a case reported recently by Dr. J. Leidy, Jr., a man was rendered unconscious by breathing the vapors of naphtha from a tank, which he was set to work to clean. The inhalation of naphtha vapor has been recommended in asthma.

**Rhigolene**, one of the lightest products of the distillation of petroleum, is an extremely volatile fluid, boiling at about 64½° F. So great is the rapidity of its evaporation, that local temperature is depressed to 15° F. by a spray of rhigolene. The fluid should be kept in a cool place and in tightly-corked bottles. It can be used with a hand-atomizer to

* See "Diseases of the Skin," p. 74; also "Ointments and Oleates second edition," pp. 244, 245.

produce cold for local anæsthesia, as a substitute for ether. Rhigolene sprayed upon the skin soon deadens sensibility and facilitates the performance of any brief surgical operation. Its garlicky odor and inflammability are objections to its use, except in the histological laboratory, where it is employed to freeze specimens for section-cutting. Paquelin's thermo-cautery is fed by one of the lighter hydrocarbons of petroleum.

**PETROSELINUM.—Parsley.**

**Dose**, gr. xxx–ʒij; or in infusion (℥j to Oj), f℥ss–ij.

**Apiolinum.**—Apiol. Dose, ♏iii–vj.

**Pharmacology.**—The root of Petroselinum sativum (Umbelliferæ) contains a neutral principle, **Apiin**, soluble in alcohol and water; also a volatile oil. Parsley-root is carminative, diuretic, and emmenagogue. It is likewise slightly laxative, and stimulates the circulation, the skin, and bronchial mucous membrane. The seeds of parsley yield a peculiar, oily principle known as **Apiol** (a camphoraceous substance, insoluble in water, crystallizing in fine needles), and an essential oil. The alcoholic solution of a petrol-ethereal extract leaves behind, upon evaporation, a product which, if treated by caustic soda, yields a thick, reddish liquid, which boils at 275° C. (527° F.), and has a specific gravity of 1.113. To this substance, which is the true active principle of the plant, M. Chapoteaut has given the name **Apioline.** It is dispensed in capsules of 20 centigrammes or 3 minims each. A new principle, termed **Cariol**, has recently been extracted from the same source by Mourgues and Laborde, who have studied the physiological effects of the active principles.

**Physiological Action.**—Thrown under the skin or into a vein of guinea-pigs, cariol determined genital hyperæmia, increased urination, and, subsequently, general tremors and slight convulsions, paresis or motor inco-ordination, and finally, death from asphyxia. The spinal cord in the dorso-lumbar region was markedly congested. The uterine vessels of a bitch became engorged when cariol was injected into the circulation. Apiol and cariol possess a similar action upon the nervous and circulatory systems. The former causes a rapid rise of arterial pressure due to increased action of the heart and stimulation of the vasomotor centres in the medulla oblongata. Cariol exerts a less powerful influence upon the circulation than apiol. Both principles, and especially cariol, promote muscular excitability. Apiol causes congestion of the uterus and ovaries, and favors the occurrence of the menstrual discharge. Both apiol and cariol possess excito motor properties, and their physiological action justifies their employment in genito-spinal atony.*

From poisonous doses of apioline Laborde observed somnolence, stupor, paresis, motor inco-ordination, accelerated respiration and circulation, and death from asphyxia. Small doses act upon unstriated muscular fibre, especially those of the uterus, almost invariably causing abortion in pregnant guinea-pigs.

**Therapy.**—The fresh root of parsley is preferred, of which a hot infusion is administered in amenorrhœa and dysmenorrhœa. Parsley is also useful as a diuretic in dropsy, strangury, gonorrhœa, etc. Owing to a favorable report from a commission of the French Academy, apiol for a time was employed in malarial affections as a substitute for quinine, but, being found to be much inferior in antiperiodic action, it is at present seldom prescribed, except as an emmenagogue. It is said to be not abortifacient. In cases of scanty or deficient menstruation, with pains, etc., 3 to 5 minims in a capsule can be given after meals, thrice daily, for a week before the expected period. Apiol is especially appropriate when amenorrhœa depends upon anæmia.

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* *La Tribune Medicale*, Nos. 2, 3, and 4, 1891.

It may be given in combination thus:—

| | |
|---|---|
| ℞ Apiolini, | ♏l. |
| Aloini, | gr. j. |
| Sulphuris subl., | gr. l. |

M. et ft. capsul. no. x.

Sig.: A capsule night and morning a week before and during the menstrual period. Indicated in amenorrhœa and dysmenorrhœa.

| | |
|---|---|
| ℞ Apiolini, | ♏l. |
| Podophyllotoxin. | gr. j. |
| Mass. ferri carbonat., | ʒss. |
| Extr. belladonn. folior. alc., | gr. j. |

M. et ft. capsul. no. x.

Sig.: A capsule night and morning. A satisfactory prescription, especially in amenorrhœa with constipation.

In cases of pronounced anæmia the action of the apioline will be more decided if a ferruginous preparation be given with it and continued in the intervals between the menstrual periods.

Apioline regulates the menstrual flow and thereby indirectly relieves the pain of congestive or spasmodic dysmenorrhœa. It is useful likewise in atonic amenorrhœa. This remedy may be administered with advantage in all cases amenable to the influence of internal medication.

**PHENACETINUM.—Phenacetine, Para-Acetphenitidin.**

**Dose,** gr. ii–viij.

**Pharmacology.**—A coal-tar product, analogous in composition to acetanilid, occurring in white, crystalline powder, of slightly bitter taste, without odor; soluble in alcohol, glycerin, lactic acid, and sparingly in water. It is not toxic in ordinary doses, and does not appear to be followed by dangerous depression, as is the case with some other members of the aromatic group of coal-tar products. The drug should be chemically pure.* It is stated that some pharmacists have dispensed phenacetin mixed with acetanilid, on account of the lower price of the latter. The comparative solubility of the two substances in water affords a ready means of detecting this adulteration. Dr. Ludwig Reuter, of Heidelberg, has pointed out that a dangerous impurity is found in some samples of phenacetin, resulting from imperfect conversion of paraphenacetidin into phenacetin. The contamination may be detected by melting a small quantity of chloral hydrate in a test-tube at the heat of boiling water and adding one-fifth of phenacetin. If the latter be pure the mixture remains colorless, but if paraphenacetidin be present a purple color develops, passing rapidly from red into blue.

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* *Pharmaceutical Record,* December 1, 1890.

Phenacetin can, according to Hinsberg, be distinguished from acetanilid and antipyrin by finely pulverizing and heating it to ebullition with nitric acid (1: 10). An orange color is thus produced with phenacetin, while the other substances give no reaction when treated in the same manner.

**Physiological Action.**—A nervous sedative, with little effect upon the circulation. In very large amounts, Hare claims that it is more apt to disintegrate the blood than antipyrin, but its influence upon other vital functions is not so severe, and it is therefore less dangerous. Phenacetin is not, however, totally devoid of toxic influence. Cases have been reported in which vomiting, collapse, cyanosis, vertigo, profuse sweats, and an urticarial rash have followed its administration. According to the experiments of Drs. David Cerna and William S. Carter, moderate amounts of phenacetin act upon the heart, causing a rise of arterial pressure, and probably exert also a stimulant effect upon the vasomotor system. In large doses the drug reduces blood-pressure, the reduction being mainly of cardiac origin. Dr. Hirschmann, of Vienna, has observed that after the administration of phenacetin an abundance of crystals was sometimes found upon the skin. Undert he microscope they exactly resembled the crystals of phenacetin which had been given to the patient.

Phenacetin slightly reduces normal bodily heat, but more decidedly when pyrexia is present. It acts upon sensory nerves and relieves pain and spasm. In some cases a hypnotic effect seems to be produced. It favors the action of the skin and kidneys, but is not decidedly diuretic.

**Therapy.**—Phenacetin was originally introduced into medical practice as an antipyretic, and subsequently was found to possess analgesic powers, resembling antipyrin in this respect. In diseases attended by hyperpyrexia, such as rheumatism, pneumonia, typhoid fever, and phthisis pulmonalis, phenacetin exerts a very happy effect in about half the dose of antipyrin, the ordinary dose being from 3 to 8 grains (Hinsberg and Kast). The mortality of the typhoid fever of children has been very materially reduced by the employment of phenacetin or acetanilid. The fall of temperature does not occur until half an hour after the drug has been taken, and the reduction continues for four to eight hours. As an antipyretic, it is considered by many good authorities as the safest and most efficient member of the aniline group. Some, on the contrary, have not so much confidence in it as in other drugs for the prompt and certain relief of pyrexia. Good results are said to be produced in malaria by a combination of phenacetin with small dozes of quinine.

In epidemic influenza, phenacetin rapidly relieves the muscular pains and favors diaphoresis; the catarrhal symptoms subsequently require other remedies.

A combination of 4 grains of phenacetin with 3 grains each of salol and sulphate of quinine has been highly extolled. The dose is repeated every two or three hours until the pains have subsided. In the nervous sequelæ of this disease the late Dr. William F. Hutchinson, of Providence, believed that phenacetin stands first in the list of remedies.

In ordinary colds, one or two 5-grain powders of phenacetin rapidly remove all the symptoms. Where fever is present, the combination of salol with phenacetin is especially useful in influenza and rheumatism. Pills containing 2½ grains each of phenacetin-Bayer and salol are furnished by the well-known firm of W. H. Schieffelin & Co., New York. The analgesic effects of phenacetin are very marked in various forms of headache, including migraine and the headaches from eye-strain, having the advantage over antipyrin in not so frequently causing a rash.

The following combination is recommended as beneficial in migraine:—

| | |
|---|---|
| ℞ Phenacetin, | gr. xlv. |
| Caffein. sodio-salicylat., | gr. iij. |
| Quinin. hydrochlorat., | gr. j. |
| Saccharin., | gr. $\frac{1}{6}$. |

M. et div. in chart. no. x.
Sig.: One powder at a dose.

In the neuralgic pains of tabes dorsalis, in herpes zoster, and intercostal neuralgia, 5-grain doses, given every hour for three or four hours, usually afford complete relief and cause sleep. Phenacetin is extremely useful in chronic neuritis, and, according to Kater, is unsurpassed in the treatment of cerebral disorder due to excessive indulgence in alcoholic drinks.

In whooping-cough, ½-grain doses dissolved in 10 drops of glycerin are readily taken by children, and afford prompt relief, permitting sleep and ameliorating the attacks.

In delirium, a dose of 10 grains will usually afford a quiet night. Franz Mahnert* considers phenacetin a specific in acute articular rheumatism, as it reduces fever, relieves pain, and lessens the duration of the attack. It has been found useful in some cases of gonorrhœal rheumatism, and is worthy of more extended trial in this rebellious affection. Given several hours before the time of the paroxysm of intermittent fever, it prevents the chill, but does not obviate its recurrence. In insomnia from simple exhaustion, phenacetin acts admirably. Dr. Traill Green, of Easton, Pa., has found phenacetin of service in checking the frequent micturition of old people. It did not appear to be necessary to administer the remedy continuously in order to obtain the desired result.

Dr. M. H. Lees, of Knoxville, Tenn., reports that the local application of finely powdered phenacetin is efficacious in promoting the healing of traumatic, simple and syphilitic ulcers.

Phenacetin has also been employed locally in an alcoholic solution or in ointment in cases of rheumatic pains of joints.

**Lactophenin.**—A substance bearing this name and closely related to phenacetin has been studied by Landowsky. Lactophenin differs chemically from phenacetin in containing lactic instead of acetic acid. It is a white and tasteless powder, sparingly soluble in water. Lactophenin reduces abnormal temperature, but exerts little or no influence upon the circulation and respiration. This substance has been given in pneumonia, influenza, erysipelas, scarlatina, acute tuberculosis accompanied by fever and in septicæmia. It has been employed by von Jaksch in typhoid fever. The results were satisfactory, doses from 8 to 16 grains producing a decided but gradual fall of temperature, which was maintained for several hours. The subsequent rise was not accompanied by a chill. The remedy quiets delirium and has a peculiarly soothing effect. Roth has found it of value in acute rheumatism. It relieved pain and swelling and reduced fever. Lactophenin was useful in some cases of chorea and in the pains of locomotor ataxia. Occasionally it caused a sense of weight and heat in the epigastrium, but the feeling did not long continue. In two cases a rash which made its appearance was thought to be due to administration of the drug.

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* Annual Univ. Med. Sciences, 1890, vol. v, p. A-105.

Landowsky ascertained that it possessed value as a remedy in neuralgia. He states, moreover, that it exerts a genuine hypnotic effect. Lactophenin was given in daily doses ranging from 9 to 45 grains. In some cases it gave rise to diaphoresis and slight vertigo.

**Methacetin.**—This compound differs from phenacetin only in containing a methyl in place of an ethyl group. Methacetin occurs in the form of colorless, scaly crystals, is comparatively non-toxic and has the advantage of being five times more soluble in water than phenacetin. Methacetin possesses antiseptic properties and has been given in typhoid fever and pneumonia. In pulmonary tuberculosis its action was not favorable, as it gave rise to copious night-sweats. It has also been employed in neuralgia.

**Dulcin.**—(Paraphenetolcarbamide.)—On account of its remarkably sweet taste the name dulcin has been given to a substance, the chemical composition of which allies it to phenacetin. It has also been termed sucrol. Dulcin is an aromatic urea derivative. It crystallizes in the form of small, white tables, which are soluble in alcohol and ether, in 50 parts of hot water and 800 parts of cold water.

Dulcin has a pure, sweet taste and is, according to Professor Kobert, from 200 to 250 times sweeter than saccharin. Its effects have been studied by Kobert, Kossel and Paschkis. It is without influence upon rabbits. In the daily dose of half a drachm it did not disturb digestion in the rabbit or dog. It had no effect upon the respiration, circulation or central nervous system. Large doses had a toxic influence upon dogs, which died with such evidence of blood destruction as icterus. In experiments upon cats, Kobert concluded that doses corresponding to those which may be employed in the human being are without danger. In abnormally large doses cats sicken and sometimes die with cerebral symptoms. The same manner of death has been observed in frogs subjected to subcutaneous injections of dulcin.

Aldehoff dissents from the observers above quoted, having found daily doses of 15 grains harmful and even, in the course of a few weeks, fatal to dogs, who died with symptoms of acute jaundice.

Dulcin does not prevent the fermentation of yeast or the coagulation of milk. It is without influence upon the growth of micro-organisms. The urine passed after ingestion of dulcin is normal, though Paschkis believes that dulcin is partially decomposed within the organism.

Dulcin has been used in the place of sugar to sweeten the food of obese individuals, in whom it is desirable to limit the amount of saccharine food. It can be employed in small doses with advantage in diabetes mellitus. Ewald has given it in daily doses of 24 grains. It is regarded as innocuous when administered in moderate amounts.

**PHENOCOLLUM HYDROCHLORICUM.—Phenocoll Hydrochloride. Dose**, gr. viii–xx.

**Pharmacology.**—Phenocoll is derived from glycocoll, or amido-acetic acid and phenetidin, the water being abstracted. The new combination is a phenacetin, which, by the introduction of the salt-forming amido group in the acetyl radicle, is rendered readily soluble. The hydrochloride is soluble in about 16 parts of water at 17° C. (62.6° F.), and the solution is of neutral reaction. The salt crystallizes out of hot water in cubes similar to those of antipyrin; out of alcohol, in which it readily dissolves only by the aid of heat, it crystallizes in needles.

Phenocoll hydrochloride has a salty taste, with a sweetish after-taste and an aromatic odor.

The pure base, phenocollum purum, may be obtained by the action of ammonia, caustic alkali, or alkaline carbonate upon a solution of the salt, and occurs in the form of white, matted needles, which contain 1 part of water of crystallization. Hydrated phenocoll melts at about 95° C. (203° F.), the anhydrous form at 100.5° C. (212.9° F.). On account of its solubility in cold water, the salt is preferable to the pure base for use in medicine. Phenocoll is fairly stable when boiled in a dilute solution of an alkaline caustic or carbonate, though prolonged boiling causes it to separate into phenetidin and glycocoll. It is similar in its behavior toward weakened acids. After long boiling in concentrated hydrochloric acid, it is partly split up into phenetidin hydrochlorate and glycocoll.

Phenocoll hydrochloride is best administered in the form of powder. The aqueous solution, neutral at first, develops an alkaline reaction at the end of the second day.

The acetate, carbonate and salicylate of phenocoll have also been prepared. The first-named salt is easily soluble in water, and has been recommended as well adapted to hypodermic use.

**Physiological Action.**—Phenocoll exerts no deleterious influence upon animals, and does not affect the composition of the blood. A dose of 23 grains was followed by no evil consequences in the rabbit.

The physiological action of this drug has been studied by Drs. Cerna and Carter, who conclude that in ordinary amounts it is practically without effect upon the circulation, that large doses diminish the blood-pressure by influencing the heart, that phenocoll reduces the pulse-rate by stimulating the cardio-inhibitory centres. It then increases the rapidity of the pulse by paralyzing those centres. The final diminution is of cardiac origin. Upon the blood itself phenocoll has no action. Phenocoll reduces temperature by causing an enormous diminution of heat production without any alteration of heat dissipation.

In the human subject it is well tolerated by the stomach, and seems to have no injurious effect upon the kidneys. After ingestion of about

5 grammes, the urine assumes a brownish or blackish-red color. The coloration usually deepens when the urine is left long exposed to the air. Upon the addition of tincture of ferric chloride, the color becomes still darker. The drug is eliminated rapidly, and twenty-four hours after discontinuance, the reaction with the tincture of iron can no longer be obtained. Dr. P. Balzer, as a result of experiments conducted in Professor Eichhorst's clinic, states that phenocoll favors the elimination of nitrogen.

**Therapy.**—In the dose of 5 grains, phenocoll has reduced temperature in typhoid fever and pneumonia three degrees or more without causing collapse or cyanosis. In the hectic fever of phthisis, Dr. Hertel found that 8-grain doses, thrice repeated at hourly intervals, reduced temperature 1° C.; 15-grain doses effected a diminution of 1½° C. within a few hours, and the reduction continued for about two hours. Five grammes (75 grains), given in divided doses throughout the day, occasioned an almost complete defervescence. In acute inflammatory rheumatism Hertel found daily doses of 75 grains valuable in the alleviation of pain, but with little direct influence upon the fever. As soon as pain was abolished, however, the temperature fell to normal. Sweating was occasioned, and in some instances, Cohnheim observed chilliness to attend the re-ascent of temperature. In two cases Dr. P. Balzer witnessed cyanosis as a result of the administration of daily doses of a drachm or a drachm and a half of phenocoll. In some instances phenocoll was successful when other antirheumatic remedies had failed. Cohnheim obtained no good results from its use in chronic rheumatism, and in the hands of Hertel it produced no effect upon a case of gonorrhœal rheumatism. Professor Eichhorst has made use of phenocoll in typhoid fever and states that the remedy seems to exercise a favorable influence on the symptoms and the course of the disease becomes milder. Profesor Albertoni states that he has extensively employed phenocoll in malaria, and that excellent results were effected in a number of severe cases. Phenocoll is sometimes successful in malarial cases when quinine has proved ineffective. In malaria the remedy was given six or seven hours before the expected paroxysm in the dose of 15 grains. Phenocoll occasions no unpleasant after-effects, and its taste is easily disguised by mixing it with sugar. A combination of phenocoll and quinine will sometimes prove efficacious in subduing an obstinate attack of malaria which had resisted either remedy when administered alone.

It is thought that phenocoll is particularly applicable to the treatment of malarial intoxication in pregnant women.

Cohnheim found the remedy efficacious in a number of cases of neuralgia, especially when due to influenza. It was of no service in hysteria or bronchial asthma.

Doses of 8 grains have produced a good result in migraine. Dr. Modigliani has employed this remedy in juvenile cases. He found it advantageous in chorea and convulsions and in various febrile disorders.

Dr. Q. C. Smith, of Austin, Texas, writes that he has found nothing more efficient in the treatment of hectic fever than the following combination:—

℞ Phenocoll. hydrochlor.
Salicin., . . . . . . . . . . . āā gr. xlviij.
Hydrastin. sulph., . . . . . . . . . . gr. xxiv.
M. et ft. capsul. no. xxiv. Sig.: One capsule every four to eight hours.

Dr. Carl Beck, of New York, has convinced himself by clinical experiments that phenocoll is possessed of antiseptic virtues and has used it externally in various cases, embracing accidental and surgical wounds, inflamed and suppurating cases, etc. As a dry dressing he at first used the pure powder, but subsequently found that a 10-per-cent. gauze answered the same purpose. A 5-per-cent. watery and a 10- or 15-per-cent. alcoholic solution were of advantage in certain cases. A 10- or 20-per-cent. ointment was applied to ulcers and burns, but, though the results were good, the healing process seemed to take longer than under the use of gauze. An injection of a 10-per-cent alcoholic solution reduced the size and relieved the pain of a cancer, rendering desirable additional trials in the same direction. Phenocoll has the advantage of being inodorous and not productive of irritation or inflammation of the skin.

**Salocoll.**—Phenocoll salicylate has been given, for convenience, the above name. Salocoll is obtained by the action of salicylic acid upon phenocoll hydrochloride, occurs in the form of a powder, has a sweetish taste and is not easily soluble in water. It is given in the dose of 15 to 30 grains and can be repeated twice or thrice during the day. The compound is well borne by the stomach and, as far as has been observed, has no depressant effect upon the heart. Salocoll has been shown to possess antipyretic, antirheumatic and antineuralgic properties and has been thought to be especially useful in influenza.*

## PHOSPHORUS (U. S. P.).—Phosphorus.

**Dose**, gr. $\frac{1}{150}$–$\frac{1}{12}$.

### *Preparations.*

*Acidum Hypophosphorosum Dilutum* (U. S. P.).—Diluted Hypophosphorous Acid. *Dose*, ♏x–lx.

*Acidum Phosphoricum* (U. S. P.).—Phosphoric Acid. *Dose*, ♏ii–xx.

*Oleum Phosphoratum* (U. S. P.).—Phosphorated Oil (1 per cent.). *Dose*, ♏i–v.

*Pilulæ Phosphori* (U. S. P.).—Phosphorus Pills. *Dose*, one to two.

*Zinci Phosphidum* (U. S. P.).—Zinc Phosphide. *Dose*, gr. $\frac{1}{24}$–$\frac{1}{10}$.

*Liquor Phosphori* (N. F.)—Thompson's Solution of Phosphorus (each fluidrachm contains about $\frac{1}{24}$ grain of phosphorus preserved in absolute alcohol and glycerin). *Dose*, f ʒ j.

*Elixir Phosphori* (N. F.).—Elixir of Phosphorus (each fluidrachm contains $\frac{1}{50}$ grain in glycerin, alcohol, and elixir). *Dose*, f ʒ i–ij.

*Elixir Phosphori et Nucis Vomicæ* (N. F.). Elixir of Phosphorus and Nux Vomica (same as the preceding, except that to each fluidrachm is added the equivalent of two minims of tincture of nux vomica). *Dose*, f ʒ i–ij.

*Tinctura Phosphori* (*Bellevue*).—Tincture of Phosphorus (used in Bellevue Hospital). Twice the strength of the solution of phosphorus of the National Formulary. *Dose*, ♏x–xxx.

*Resina Phosphori.*—Resin containing 4 per cent. of Phosphorus. *Dose*, gr. $\frac{1}{4}$–j.

The official hypophosphites are of lime, iron, potassium and sodium; their preparations are:—

*Syrupus Hypophosphitum* (U. S. P.).—Syrup of Hypophosphites (contains of the lime salt 45, sodium and potassium salts 15 each, spirit of lemon 5, sugar 500, and water q. s. ad 1000 parts). *Dose*, fʒj–℥j.

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* *The American Therapist*, June, 1893.

*Syrupus Hypophosphitum cum Ferro* (U. S. P.).—Syrup of Hypophosphites with Iron (1 part each of ferrous lactate and potassium citrate added to the preceding enough to make 100 parts). *Dose*, fʒi–℥j.

*Syrupus Hypophosphitum Compositus* (N. F.).—Compound Syrup of the Hypophosphites (each fluidrachm contains lime hypophosphite, gr. ij; sodium and potassium hypophosphite, āā gr. j; iron and manganese hypophosphite, gr. $\frac{1}{8}$; quinine hydrochlorate, gr. $\frac{1}{16}$; and tincture of nux vomica, ♏i$\frac{1}{4}$). *Dose*, fʒj–℥j.

*Liquor Hypophosphitum Acidus.*—Acid Solution of the Hypophosphites. *Dose*, fʒi–iv.

The official phosphates are of iron (also pyrophosphate of iron), soda (and sodium pyrophosphate), and the precipitated calcium phosphate. The preparations are:—

*Syrupus Calcii Lactophosphatis* (U. S. P.).—Syrup of Calcium Lactophosphate (contains the precipitated phosphate, lactic acid, orange-flower water, sugar, phosphoric acid, and water. *Dose*, fʒi–iv.

*Syrupus Ferri, Quininæ, et Strychninæ Phosphatum* (U. S. P.).—Syrup of the Phosphates of Iron, Quinine, and Strychnine. *Dose*, fʒss–j.

*Syrupus Phosphatum Compositus* (N. F.).—Compound Syrup of the Phosphates, or Parrish's Chemical Food (each fluidrachm contains, of lime phosphate, gr. ij; iron phosphate and ammonium phosphate, gr. j each; and smaller quantities of phosphates of sodium and of potassium). *Dose*, fʒi–ij.

**Pharmacology.**—Phosphorus, a non-metallic element, was obtained by Brandt, in 1669, from urine. It is a soft, flesh-colored solid, very inflammable, oxidizing upon exposure to the air. Phosphorus melts at 110° F., and friction causes it to ignite at ordinary temperature. It possesses an alliaceous odor, is insoluble in water, sparingly soluble in alcohol, ether and chloroform; more soluble in oils, and dissolves readily in carbon disulphide. Occurs in nature as tribasic phosphate of lime in primitive and volcanic rocks, and in the bones of vertebrates. In brain and nerve tissue it exists in combination with fat as lecithin; and in all vascular structures, in the form of triple phosphate, it is an important constituent. It is excreted in small quantity normally by the urine in the form of phosphates; occasionally, when oxidation is interfered with or an excess of phosphorus introduced into the blood, it is excreted in its own form by the breath, urine, and perspiration, making the person luminous. Phosphorus is likewise eliminated by the liver.

**Physiological Action.**—In medicinal doses the action of phosphorus upon the nervous system is that of a tonic and stimulant, and it also accelerates cell-growth in organs and tissues and particularly in the skin. On the circulation it acts primarily as a stimulant, making the pulse fuller and more frequent; the capillary expansion is flushed, and free perspiration follows; as a consequence, the temperature of the surface is at first slightly raised, but subsequently falls several degrees. Small doses of phosphorus have a favorable influence upon the composition of the hæmoglobin; immoderate quantities have a deleterious effect.

The kidneys are also flushed, the quantity of urine becomes larger, the proportion of urates and urea is decidedly increased; hæmaturia oftens results from a poisonous dose. No influence is observed upon the digestion from small doses, though larger ones cause irritation. Muscular power is enhanced and the sexual appetite stimulated. Mental operations are easily performed, and it is said that tactile insensibility is heightened. The body weight is increased. Jaundice may occur from interference with the functions of the liver, and biliary acids may appear in the urine. Purpura is sometimes due to the administration of phosphorus. Wegner has shown that phosphorus also exerts a marked influence in promoting the growth of bone. Phosphorus in substance is very inflammable and produces extremely painful burns.

**Toxic Effects.**—In single poisonous doses phosphorus is a violent irritant, causing gastric inflammation; and if death does not quickly occur, fatty degeneration of muscular tissues and acute yellow atrophy of the liver will follow. This result may also succeed the medicinal use of phosophorus, when continued too long, or if the dose be considerable. When the poisonous action is very slow, as where workmen are exposed to the fumes of phosphorus in making friction-matches, the toxic effects are shown by the death of certain bones, particularly the jaw-bone. This occurs frequently, and is known as "phosphor-necrosis."

**Acute Phosphorus Poisoning.**—When, as not rarely happens, an infusion of match-heads is swallowed, or phosphorus-paste* used for poisoning rats is taken with suicidal intent, or an overdose of a medicinal preparation of crude phosphorus is swallowed, the first symptom is pain and burning at the epigastrium, with vomiting. The vomited matter and even the stools are sometimes phosphorescent, with intestinal irritation and purging, and death occurs from exhaustion. The blood is robbed of its oxygen, becomes black, unusually liquid, and loaded with products of decomposition; the capillary tissues yield and the extravasations of blood produce purpura, hæmaturia, and hæmorrhages. Temperature is reduced, jaundice is frequent, and convulsions and coma are not uncommon. The urine is usually scanty and albuminous. In some instances it has contained sugar. After the development of jaundice bile-acids and biliary coloring matter make their appearance in the urine. In women fatal doses generally cause a bloody discharge from the uterus, and if pregnancy exists the drug occasions abortion. One and a half grains of phosphorus have proved fatal.

**Antidotes.**—The best antidote is copper sulphate, used freely as an emetic, followed by magnesia sulphate to clear the intestinal canal. Albuminous and mucilaginous drinks, in which magnesia hydrate is suspended, are useful. Oil, being a solvent of phosphorus, should be avoided, except old French oil of turpentine, which contains oxygen and is a chemical antidote. Oxygen inhalations have been proposed to overcome the depression due to altered blood. Professor Bokai recommends potassium permanganate as an antidote to poisoning by phosphorus. In the stomach manganese chloride is formed with the liberation of oxygen and the conversion of phosphorus into ortho-phosphoric acid. He advises the use of a $\frac{1}{3}$-per-cent. solution of permanganate.

If the poison has been retained for a time, death will occur from the fatty degeneration of the stomach, liver, and other organs. Phosphor-necrosis may be prevented by thorough ventilation of the work-room, or by the workmen wearing masks or respirators, covering the mouth and nose. It is also believed that the vapor of turpentine, carried in a small bottle suspended from the neck while at work, exerts some protective influence. Since carious teeth favor the occurrence of phosphor-necrosis, those working amid these fumes should be warned to keep their teeth in good condition.

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* Phosphorus-paste, for destruction of house vermin, is made by rubbing together 6 parts of phosphorus and sulphur with 6 parts of cold water until they liquefy. Then add 2 parts mustard-flour, 8 parts of sugar, and 12 of rye-flour, making a paste. To be kept closely stopped in tin boxes.

**Therapy.**—In neurasthenia, or nervous debility, where the system is weakened by anxiety, overwork, or sexual excesses, and in neuralgia, phosphorus is a valuable tonic and restorative, but has less control over pain than many other agents. It is sometimes given with success in herpes zoster. In small doses continued for considerable periods it is of service in arresting fatty degeneration of the heart and ameliorating the symptoms due to that condition. Phosphorus is of value in supporting the system when exposed to severe and prolonged bodily or mental strain. Phosphorus is not infrequently of service in the treatment of angina pectoris. In reduced nutrition of nervous centres this remedy is valuable, as in atheroma of the cerebral vessels, white softening, insomnia of the aged, hysterical paralysis and melancholia, morphinomania, and chronic alcoholism. It checks sweating due to nervous debility. Phosphorus may be employed as a restorative after typhoid fever or typhoid pneumonia, and phosphorated oil is said to be valuable in intermittent fever. In anæmia, small doses in conjunction with iron are of considerable service. In so-called pernicious anæmia, or anhæmatosis, small doses of phosphorus seem to have some influence in checking the progress of the disease. In rickets and osteomalacia, also, clinical experience has pronounced in favor of phosphorus, especially in the form of oleum phosphoratum given with codliver-oil.

| | |
|---|---|
| ℞ Ol. phosphorati, | ♏xvj. |
| Ol. morrhuæ, | f℥iv. |

M. Sig.: A teaspoonful four times a day.

The following prescriptions are recommended by Kassowitz in the treatment of rickets:—

| | |
|---|---|
| ℞ Phosphori, | gr. $\frac{2}{13}$. |
| Saccharin, | gr. lxxvij. |
| Ess. limonis, | ♏ij. |
| Ol. morrhuæ, | f℥iiiss. |

M. Sig.: Dose, a teaspoonful.

| | | |
|---|---|---|
| ℞ Phosphori, | | gr. $\frac{2}{13}$. |
| Lipanin., | | f℥j. |
| Sacch. alb., | | |
| Pulv. acaciæ, | āā | ℥ss. |
| Aq. dest., | | fʒiiiss. |

M. Dose, a teaspoonful.

Phosphorus may be advantageously incorporated in butter together with iodine and bromine and administered to children in indicated cases as a substitute for codliver oil in summer. Dr. J. Comby recommends the following formula, a modification of that proposed by Trousseau:—phosphorus, $\frac{1}{7}$ grain; potassium iodide, 4 grains; potassium bromide, 15 grains; sodium chloride, 2 drachms; fresh butter, 1 pound 1½ ounce. Of this mixture about ⅓ ounce is given daily spread upon bread.

When, in eruptive fevers (in scarlatina, measles, etc.), the exanthem does not come out or it recedes, the administration of phosphorus is often resorted to with advantage. In some instances phosphorus will render good service in the exhaustion of typhoid and typhus fevers. Travignot, Squire and other writers have used this remedy with advantage in diabetes mellitus. In scanty and irregular menstruation attended with headache the continued administration of phosphorus exercises a beneficial influence on the character of the periods. Phillips commends the action of phosphorus in cases of hysteria dependent upon sudden shock as well as those connected with delayed or suppressed menses.

In skin diseases, phosphorus and its compounds are useful as substitutes for arsenic, and in some cases are superior to this drug. In crops of boils, acne indurata or inveterata, and eczema of nervous origin, calcium phosphate or the alkaline hypophosphites are highly serviceable.

In lupus erythematosus Dr. L. D. Bulkley often prescribes:—

℞ Phosphori, . . . . . . . . . . . . . gr. vj.
Alcohol. absolut., . . . . . . . . . . . . fʒxxx.

Dissolve with heat and agitation and mix, while still warm, with the following mixture, also warm:

℞ Glycerin, . . . . . . . . . . . . f℥ixss.
Alcohol, . . . . . . . . . . . . . f℥iss.
Ess. menth. pip., . . . . . . . . . . . f℥ss.
M. Each drachm contains $\frac{1}{20}$ grain of phosphorus.

**Phosphates and Hypophosphites.**—In some cases, medicinal doses of phosphorus cause feebleness of the heart's action with threatening collapse, or acute gastric pain; and, in others, fatty degeneration of the muscles and viscera. This does not occur after using the salts of phosphoric and hypophosphoric acids and their preparations. The phosphates have physiological actions and therapeutical powers differing from those of phosphorus. Sodium phosphate, for instance, is a valuable cholagogue and is slightly laxative, making it of special service in treating children who pass clay-colored fæces, and also in catarrhal jaundice, owing to its action upon the liver. It is of benefit in rheumatism, either alone or combined, thus:—

℞ Sodii phosphat.,
Acidi salicylici, . . . . . . . . . . āā gr. c.
M. et ft. capsulæ no. xx.
Sig. A capsule or two every two hours for rheumatism.

For gout and rheumatism, Dr. F. L. Satterlee recommends the following prescription containing the sodium phosphate:—

℞ Lithii benzoat., . . . . . . . . . . . ʒss.
Sodii bromid.,
Potassii carbonat. pur., . . . . . . . . . āā ʒij.
Potassii acetat., . . . . . . . . . . . ℥iss.
Sodii phosphat., . . . . . . . . . . . ℥ss.
Syr. zingiberis,
Aq. menth. pip., . . . . . . . . . . āā f℥vj.
M. Sig.: A teaspoonful to a tablespoonful in half a glass of water every four or six hours after food.

Calcium phosphate, made soluble by combination with lactic acid in the form of the syrup of calcium lacto-phosphate, is a valuable reconstructive and tonic in feeble children with deficient development of bone, and also in surgery, in treating ununited fracture. Exhaustion and anæmia, produced by long-continued suppuration or lactation, leucorrhœa, or chronic diarrhœa, are benefited by this preparation, which is also useful in caries. The compound syrup of the phosphates, or chemical food, has been found to be especially serviceable in these cases.

A class of preparations known as glycero-phosphates of calcium, potassium and sodium are praised by M. Albert Robin as of efficacy in the treatment of various depressed conditions of the nervous system. They may be given either by the mouth or subcutaneously, in the latter case 4 grains being an active dose. Dr. Robin has obtained excellent results from the use of these phosphates in convalescence from influenza, in neurasthenia, phosphaturia, phosphatic albuminuria, etc. In sciatica and Addison's disease he also witnessed notable improvement follow the use of the same preparations. The subcutaneous injection of glycerophosphates proved of decided benefit in an obstinate case of *tic douloureux*, which was accompanied by distressing paræsthesia.

The hypophosphites have been largely used and highly extolled by Dr. Churchill in the treatment of pulmonary consumption, especially the alkaline hypophosphites, which should be perfectly pure, like those of Dr. R. W. Gardner, of New York. The object of treatment being to obtain calcareous degeneration of the tubercles, calcium hypophosphite may be administered alone, having the advantage of being nearly tasteless; it may be given in doses of gr. v–xx in pill form, or with an equal quantity of milk or cane sugar. The following prescription, containing the hypophosphites, is suitable as a tonic, especially in chronic bronchitis:—

| | | |
|---|---|---|
| ℞ | Acidi phosphorici dil., . . . . . . . . | fʒiij. |
| | Syrup. pruni Virg., . . . . . . . . | fʒij. |
| | Syr. hypophosphitum comp., . . . . q. s. ad | f℥v. |

M. Sig.: A teaspoonful in water three or four times a day.

**Caution.**—As a subject of interest and possible importance, it should be mentioned that the hypophosphites should not be triturated in a mortar, as they are liable to explode. Dr. H. Gifford, of Syracuse, while triturating a mixture containing 3 parts of calcium hypophosphite, and 1 of sodium hypophosphite, made this discovery, the compound exploding like gunpowder, severely burning his face and eyes and destroying the sight of one of them.

In order to overcome the disadvantages of vitreous phosphorus Dr. E. Q. Thornton has lately recommended the substitution of the red or amorphous variety, which is made by heating vitreous phosphorus to 250° C. (482$^c$ F.) in the absence of air. Amorphous phosphorus is almost completely destitute of taste or odor, has no irritant or caustic effect and is non-toxic.

## **PHYSOSTIGMA** (U. S. P.).—**Calabar Bean.**

### *Preparations.*

*Extractum Physostigmatis* (U. S. P.).—Extract of Physostigma. *Dose*, gr. $\frac{1}{6}$–iv.
*Tinctura Physostigmatis* (U. S. P.).—Tincture of Physostigma. *Dose*, ♏xv–xl.

*Physostigminæ Salicylas* (U. S. P.).—Physostigmine Salicylate. *Dose*, $\frac{1}{64}$–$\frac{1}{20}$.
*Physostigminæ Sulphas* (U. S. P.).—Physostigmine Sulphate. *Dose*, gr. $\frac{1}{60}$–$\frac{1}{20}$.
Physostigmine Hydrobromate is also employed in doses of from $\frac{1}{60}$–$\frac{1}{20}$ grain.

**Pharmacology.**—The ordeal bean of old Calabar is the seed of Physostigma venenosum (Leguminosæ, Papilionaceæ), growing in Western Africa along the river Niger. It contains the alkaloid **Physostigmine** (also known as **Eserine**) and **Calabarine,** starchy matters, oils, etc. The salts of physostigmine vary in solubility; that with salicylic acid is soluble and permanent, and has been made official. The sulphate is also now official. Jobst and Hesse, in 1864, first isolated the active principle as an amorphous alkaloid, to which they gave the name of physostigmine. Subsequently a crystalline, alkaloidal principle was found in the seeds by Vée and Leven, who gave it the name of eserine; the former was tasteless, the latter has a bitter taste. Eserine dissolves sparingly in water; it is easily soluble in ether, alcohol and chloroform. In physiological effects they are analogous, and they are now regarded as different forms of the same substance. Bihringer has recently discovered in Calabar bean a new alkaloid, which he proposes to call **Eseridine.** It is said to act as a laxative or motor excitant, and to be six times weaker than physostigmine. A substance termed **Physosterin,** related to cholesterin, is also present in physostigma. The presence of physostigmine may be demonstrated by dissolving a small quantity in 1 or 2 drops of fuming nitric acid. A bright yellow liquid, which is the result, darkens in shade when heated on a water-bath and upon evaporation the color changes to green. The addition of a drop of strong nitric acid with heat produces a violet red, changing to a dark green solution.

**Physiological Action and Toxic Effects.**—In large doses, physostigma is a powerful poison, producing extreme muscular debility, vomiting, slow and weak pulse; it causes death either by cardiac syncope or, in smaller quantity, by paralysis of the respiratory centre and suffocation. Atropine counteracts the respiratory depression and strychnine stimulates the cord, and thus act as physiological antidotes. Applied to the surface of the body, no effect is observed unless absorption occurs (except when introduced into the eye, it causes contraction of the pupil, beginning in about fifteen minutes and lasting for about eight hours, attended by slight twitching of the lids, supra-orbital pain, dimness of vision, fall of intra-ocular tension, spasm of accommodation, and myopia). The pupil contraction is held to be due to paralysis of the peripheral vaso-motor nerve-fibres, and to stimulation of the fibres of the third nerve supplying the iris (Farquharson). Contraction of the pupil may also be produced by the internal administration of the drug, but this result does not always follow. This fact, as Phillips remarks, may aid in distinguishing poison due to physostigma from that of opium. The brain is not affected, but the spinal cord suffers great depression of both motor and reflex activity. The conductivity of the motor nerves is also reduced. The pulse and respiration become slower and fuller after small doses, the arterial tension being at first increased; but in larger amounts, as the system becomes more influenced by the toxic action of the drug, the pulse becomes feeble and irregular and the arterial tension falls. This is explained by the primary stimulation and subsequent exhaustion of the peripheral cardiac filaments of the vagi. The secretions are slightly increased by Calabar bean, and vomiting and retching are apt to occur. Peristaltic action as well as the intestinal fluids are increased, and diarrhœa is a usual physiological consequence. Eserine sulphate is said to have excited the pregnant womb to contraction. The bladder and spleen also contract under the influence of physostigma. The active principle is largely excreted by the kidneys, and likewise by the saliva and bile, and has even been found in the gastric secretions after intra-venous injection. Physostigma is promptly absorbed and elimination takes place with corresponding rapidity.

**Therapy.**—Eserine, or physostigmine, is used by oculists to break up adhesions of the iris, diminish intra-ocular tension, and prevent the prolapse of the iris after wound or ulcer of the cornea. It is serviceable in treating glaucoma; a solution of gr. ij to fʒj of distilled water, being instilled into the eye every fifteen minutes, soon gives relief. In the prodromal stage of glaucoma eserine has a tendency to abort the attack. During the acute inflammatory period it relieves pain. The application of eserine, moreover, is useful as a preparation for the operation. In coal-miners' nystagmus, M. Romié finds that a collyrium containing about 1½ grain of eserine sulphate to the ounce of distilled water is of service in diminishing the oscillation of the eyeballs. One drop of the solution is instilled into the eye thrice daily and strychnine sulphate is at the same time given by the mouth.

It is useful in photophobia, reducing the amount of light by contracting the pupil, and diminishing the blood-supply by emptying the blood-vessels. Eserine is also employed in neuralgia of the eyeball, and to counteract the excessive action of atropine. In ulceration or suppuration of the cornea and in strumous ophthalmia the local action of eserine is very beneficial.

As a myotic M. Berger recommends a combination of:—

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|---|---|
| ℞ Eserin. sulphat., | gr. xv. |
| Pilocarpin. hydrobromat., | gr. xxx. |
| Aq. destill., | f℥ iij. |

M.

Internally, physostigma is useful in constipation due to defective secretion and to insufficient peristalsis, combined with other remedies, such as belladonna.

| | |
|---|---|
| ℞ Ext. physostigmatis, | gr. iij. |
| Ext. belladonnæ folior. alc., | gr. j. |
| Res. podophylli, | gr. iij. |
| Ol. cajuputi, | ♏iv. |

M. et ft. pil. no. xij.
Sig.: Take one or two at bed-time.

Bartholow gives the following formula:—

| | |
|---|---|
| ℞ Tinct. physostigmatis, | |
| Tinct. nucis vomicæ, | |
| Tinct. belladonnæ, | āā fʒij. |

M. Sig.: Thirty drops in water morning and evening for constipation of bowels.

This combination is useful in treating the digestive disorders of women at the change of life, relieving headache, vertigo, and flatulence. This remedy is said to be useful in the treatment of dilatation of the stomach. In tetanus physostigma gives excellent results, recovery following in more than half the cases. Care should be taken that the extract or other preparation used is of good quality, and it should be pushed until decided physiological effects are produced, as recommended by Fraser; 1 grain by the stomach, or $\frac{1}{3}$ grain hypodermically, of a good extract, is enough to commence with, repeated every two hours, and increased or reduced, according to effect. In other nerve affections, chorea, and epilepsy, and in progressive paralysis, great improvement has been noted. Physostigma has been successfully used in infantile convulsions after the failure of chloroform. In convulsive disorders of individual muscles of the face (histrionic spasm, tic, twitching of orbicularis, etc.), good results follow its employment. Calabar bean has likewise proved beneficial in writers' cramp. It has been used with success in the treatment of obstinate cases of hiccough.

Temporary improvement, or arrested progress, was observed by Ringer and Murrell in paraplegia supposed to be due to myelitis. The same authorities saw improvement follow administration of the drug in locomotor ataxia. Physostigma is also capable of controlling the night-sweats of phthisis; at least, in some cases. Murrell gave $\frac{1}{60}$ grain of extract in pill two or three times during the night, or $\frac{1}{60}$ grain of an eserine salt, and found that not only was sweating suppressed for the time, but that in some instances it did not recur for three or four weeks.

Professor de Giovanni, of Turin, has employed physostigma with good results in cases of renal hæmorrhage. He combines it with ergotin, as:—

℞ Extr. physostignatis, . . . . . . . . . . gr. vj.
Ergotin., . . . . . . . . . . . . . gr. xxx.
Extr. gentian., . . . . . . . . . . q. s.
M. et ft. pil. no. xx.

Sig.: One or two pills a day, increased every day by one until the desired effect is produced or the limit of tolerance is reached. The same combination has been found of service in the treatment of symptoms dependent upon atheroma of the arteries.

In strychnine poisoning, while the symptoms are modified, there has been no case of recovery from the use of physostigmine alone, but the bromides might be combined with it advantageously. In some affections of the air-passages, bronchitis, congestion of the lungs, and pneumonia, physostigma may be used to lower the excitability of the vagus and the activity of the heart and respiration. On account of its tonic effect upon the muscular coat of the bronchi, this drug is occasionally serviceable in bronchial asthma and emphysema. The tincture of physostigma, when well made, is a good preparation, but for hypodermic and ophthalmological purposes physostigmine salicylate is preferable.

## PHYTOLACCA.—Poke.

## PHYTOLACCÆ FRUCTUS (U. S. P.).—Poke-Fruit.

## PHYTOLACCÆ RADIX (U. S. P.).—Poke-Root.

*Preparations.*

*Pulvis Phytolaccæ Radicis.*—Powdered Phytolacca-Root. *Dose,* gr. i–v.

*Extractum Phytolaccæ Radicis Fluidum* (U. S. P.).—Fluid Extract of Phytolacca-Root. *Dose,* ♏v–fʒj.

*Tinctura Phytolaccæ Radicis.*—Tincture of Phytolacca (1 to 10). *Dose,* ♏x–fʒj.

**Pharmacology.**—The fruit and root of Phytolacca decandra (Phytolaccaceæ) are each official. The active principle has not been isolated; but the plant contains a resin and a neutral principle, **Phytolaccin,** and **Phytolaccic acid**; also tannin, oil, starch, etc. The berries are dark, purple, globular, about ⅓ inch in diameter, comprising ten carpels, each holding one black seed. The juice is red, acrid, rather sweet to the taste, as is also the root.

**Physiological Action.**—The powdered root is irritating to the air-passages, and when inhaled causes pains in chest, back, and abdomen, with injection and irritation of the eyes, and occasionally vomiting and purging. Applied to the skin, it occasions an erythematous eruption and excoriations. Poke is emetic, cathartic, narcotic, and is claimed to be alterative. As it only acts slowly, and creates much nausea and depression, it is never used as an emetic. It reduces the force of the pulse and frequency of the heart's action, and also the rate of respiration. It acts decidedly upon the nerve-centres, paralyzing the cord and medulla, death being produced by carbonic-acid poisoning from failure of respiration. As it is a remedy easily obtained and used by a class of "herb-doctors," it is not surprising that cases of fatal poisoning have occurred. The antidotes are the diffusible stimulants, ammonia, alcohol, and ether, with hypodermic injections of digitalis and small doses of morphine and atropine, with artificial respiration and counter-irritation.

**Therapy.**—In follicular pharyngitis, tonsillitis, granular eyelids, mastitis, malignant disease, varicose veins and ulcers, and in a large variety of skin disorders, such as chronic eczema, sycosis, favus, and abscesses, various observers have reported good results from the external and internal use of poke-root. The following formulæ are recommended :—

℞ Pulveris phytolaccæ radicis, . . . . . . . . ʒj.
Camphoræ, . . . . . . . . . . gr. x.
Extracti belladonnæ folior. alc., . . . . . . ℈j.
Ungt. zinci oxidi benz., . . . . . . . . ℥j.
M. For chronic ulcers, fissure and fistula, and mammary abscesses.

℞ Pulveris phytolaccæ radicis, . . . . . . . . ℈j.
Ungt. resinæ comp., . . . . . . . . . ℥j.
M. Useful in boils and carbuncles.

℞ Pulveris phytolaccæ radicis, . . . . . . . . ʒj.
Mentholi, . . . . . . . . . . . gr. x.
Lanolini, . . . . . . . . . . . . ℥j.
M. Useful in chronic eczema and chronic sycosis.

The fluid extract, applied upon absorbent cotton, is useful in checking the formation of a bubo. The pain produced by burns is alleviated by the local application of phytolacca. The fluid extract is esteemed valuable in the treatment of syphilis, scrofula, rheumatism, and in chronic skin diseases. The tincture and the fluid extract have yielded good results in chronic rheumatism and rheumatic swelling of the joints. Phytolacca is highly esteemed as a remedy for acute mastitis, applied locally and taken internally. M. M. Griffith claims that this remedy has very decided power in diminishing obesity. A resinoid called phytolin, said to be obtained from phytolacca berries by a process of sun distillation possesses the property of reducing obesity without, it is claimed, affecting the general health.

**PICHI.** See Fabiana Imbricata.

**PICROTOXINUM** (U. S. P.).—**Picrotoxin.**
A neutral principle prepared from the seeds of Anamirta paniculata (Menispermaceæ) or Cocculus Indicus.

**PILOCARPUS** (U. S. P.).—**Pilocarpus, Jaborandi.**
**Dose,** gr. x–ʒj.

*Preparations.*

*Extractum Pilocarpi Fluidum* (U. S. P.).—Fluid Extract of Pilocarpus. *Dose,* ♏x–lx.

*Pilocarpinæ Hydrochloras* (U. S. P.).—Pilocarpine Hydrochlorate. *Dose,* gr. $\frac{1}{12}$–$\frac{1}{3}$.

*Infusum Pilocarpi.*—Infusion of Jaborandi (ʒj–Oj). *Dose,* fʒij–℥iv.

**Pharmacology.**—Pilocarpus is the leaflets of Pilocarpus Selloanus and Pilocarpus Jaborandi (Rutaceæ) of Brazil. They contain an alkaloid, **Pilocarpine** ($\frac{1}{4}$ to $\frac{1}{2}$, or 1 per cent.), **Jaborine,** volatile oil, and probably a peculiar acid. The active principles are soluble in alcohol, but only imperfectly so in water.

**Physiological Action.**—In about fifteen minutes after jaborandi has been swallowed, the face flushes and perspiration occurs, with more or less salivation; the two being related to each other in such manner that if there is little action upon the skin there will be more discharge of secretion from the salivary glands, and when the skin acts freely the salivation will be less. The profuse sweating removes not only water but other matters from the blood, as it has been found to carry off urea and certain excrementitious materials. Arterial tension is reduced and temperature falls 1° to 4°. A series of experiments carried on by Professor Edward T. Reichert led to the following conclusions regarding the influence of pilocarpine upon bodily temperature: Pilocarpine first increases and then decreases both the production and the dissipation of body heat. The alterations depend essentially upon the action on heat production. The decrease is due to a diminished production, but may, in part, be caused by sweating.

The action upon the skin is attributed to vaso-motor paralysis, and the sialagogue action to stimulation of the peripheral nerves of the glands. Jaborandi also increases the action of the heart and respiration, but in larger doses depresses them by its paralyzing action on the vagus. Contraction of the pupil, with impaired power of accommodation, has been observed to follow its use. The same result is produced by its topical application. Atropine and muscarine are antagonistic in their effects to jaborandi or pilocarpine.

**Pilocarpine** readily diffuses into the blood, and is eliminated chiefly by the skin and salivary glands. Most secreting glands are similarly affected, to a greater or less degree. The gastric and pancreatic fluids are decidedly augmented. A certain though less powerful stimulant effect is exerted upon the liver. The lachrymal, mammary, and bronchial mucous glands are also excited. It increases the discharge of urea by the kidneys, but not the urinary water. Small and repeated doses of pilocarpine, however, have a diuretic effect. It causes contractions of the uterus, and may induce abortion; it also reduces the size of the spleen. Children are less susceptible than adults to the action of pilocarpine. Demme, of Berne, has observed that under four years of age the action of this substance is more decided upon the salivary glands than upon the skin. **Jaborine,** the second alkaloid which is separated from pilocarpus, acts similarly to atropine. The presence of this alkaloid explains the different effects following the use of pilocarpine which has been improperly made. It is therefore very necessary, in using pilocarpine, or any of its preparations, to obtain them free from jaborine.

Serious and even fatal consequences have occurred as a result of injection of medicinal doses of pilocarpine. After employment of ⅓ grain a patient suffered from profuse diaphoresis, salivation, lachrymation, a discharge from the nose, sickness of the stomach, difficulty in breathing and a sense of cardiac oppression. Internal and external stimulation caused the symptoms to disappear. Rémy mentions a case in which the remedy induced a series of epileptic attacks. In another case the patient suddenly expired directly after an injection had been made. Such accidents should teach caution in the use of the remedy.

**Therapy.**—It has been noticed by Prentiss that under the use of pilocarpine the color of the hair darkens. It may thus be combined with a stimulant application to the scalp:—

℞ Ext. pilocarpi fl.,
Lin. saponis, . . . . . . . . . . āā f℥ss.
Spiritus odorati, . . . . . . . . . . f℥ij.
M. Sig.: To be applied to the scalp once daily, with friction, for alopecia and falling of the hair.

In cases where diaphoresis is desired in order to remove matters from the blood or reduce temperature, pilocarpus is a convenient agent. Thus, in acute erysipelas, its action is so prompt and effective that it might almost be regarded as a specific. Professor Waugh points out that the diaphoresis is at once followed by retrogression of the rash and improvement of the general condition, but that in atonic cases, when the heart is weak and perspiration cannot be induced by jaborandi, no beneficial action is observed. In diphtheria, also it is serviceable, but the depressing effect upon the heart must be kept in mind. Pulmonary œdema, also, may follow the administration of this drug; so that, although it is capable of detaching false membrane, it is of doubtful value, demands vigilant watchfulness, and should only be administered to previously strong individuals. Similarly, in mumps or parotitis it often abruptly stops the course of the disease. In agalactia of nursing women, small doses of pilocarpine restore the secretion of milk. Where there is œdema or effusion, the fluid extract of jaborandi is very commonly employed, in moderate doses, to keep up the action of the skin and increase the elimination of urea. In diabetes insipidus, alternated with the fluid extract of ergot, it reduces the urinary flow very decidedly. In asthma, or hiccough, a hypodermic injection of pilocarpine is sometimes promptly curative. Pilocarpine given subcutaneously may be of service in controlling the convulsive attacks of hystero-epilepsy and maniacal excitement. It was employed with advantage by Dr. Kernig in a case of status epilepticus. Dr. Ch. Féré, on the contrary, whose experience in nervous disorders is large, asserts that he has never witnessed benefit from the injection of pilocarpine in epilepsy, and that sometimes it even seems to bring on a paroxysm. Jaborandi has been advantageously employed in whooping-cough. In small doses it, or its alkaloid, is useful in chronic bronchitis and winter cough. In doses sufficient to excite free diaphoresis, this remedy has proved very efficacious in the congestive stage of pneumonia, rapidly ameliorating the local condition and reducing the fever. When atropine is administered to check night-sweats in phthisis, it may be combined with fluid extract of jaborandi, which, as pointed out by Da Costa, relieves the dryness of the throat caused by the atropine. Pilocarpine itself is by no means an inefficient remedy for this manifestation, and the hydrochlorate may be given nightly in $\frac{1}{20}$-grain dose by the mouth, with, usually, a good effect both upon the sweats and the cough. Professor Ringer has cured several cases of unilateral sweating by the hypodermic injection of full doses of pilocarpine. In ptyalism, also, pilocarpine has been advantageously employed in the same manner. In amblyopia of tobacco and alcohol origin, and in amaurosis, pilocarpine is frequently used with good effect, and also in many other lesions and disorders of the eyeball. A few drops of a solution of pilocarpine (2 grains to the ounce) may be locally employed with advantage in rheumatic iritis. The subcutaneous use of this remedy is also of avail in rheumatic iritis. Dr. G. H. Burnham, of Toronto, reports a case in which this method was followed by very excellent results. There was no iritis, but the centre of each cornea was studded with infiltrations. The pupillary area was involved and vision was very imperfect. The infiltrations disappeared, vision gained greatly, and the general manifestations of chronic rheumatism were also improved. Internally, the alkaloid is sometimes beneficial in detachment of the retina, and decidedly so in optic neuritis. Its action upon the pupil enables it to be used in place of eserine. Staderini* (*Annali di Otalmologia*) advises pilocarpine nitrate in gr. $\frac{1}{8}$ to $\frac{1}{10}$, subcutaneously, in many inflammatory diseases of the eyes, especially in those that are the consequence of rheumatism, as episcleritis, iritis, and idiopathic optic neuritis. Pilocarpine nitrate thus given, he states, subdues inflammatory conditions of the iris and of the ciliary body which supervene when masses of the cortical substance of the lens remain in the anterior chamber after the operation of extraction of cataract. Pilocarpine, the same writer believes, promotes the absorption of non-organized opacities in the vitreous humor, especially when these opacities are the consequence of recent infiltration. Progressive myopia, he further adds, shows improvement of vision after pilocarpine injection. In glaucomatous conditions of children, when eserine does not agree with the patient, Drs. Saint-Germain and Valude advise a collyrium containing 4½ grains of pilocarpine to 2½ drachms of distilled water. M. Berger adds pilocarpine to solutions of cocaine for use in the eye in order to avoid difficulties of mydriasis and a disturbance of accommodation. His formula is :—

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* "Pilocarpine in Ocular Therapeutics," by G. Staderini, *St. Louis Clinique*, January, 1891.

| | |
|---|---|
| ℞ Cocain. hydrochlorat., | |
| Pilocarpin. hydrochlorat., . . . . . . | āā gr. xx. |
| Aq. destill., . . . . . . . . . . | f℥iij. |
| M. | |

Dr. A. D. Macdonald records a case, believed to be one of labyrinthine deafness, in which decided improvement followed the subcutaneous injection of pilocarpine. Professor Politzer and others teach that the hypodermic injection every day of ⅓ grain of pilocarpine will cure certain cases of inflammatory, syphilitic and hæmorrhagic deposit within the labyrinth, especially when of recent occurrence. If, however, no improvement has taken place after the lapse of a fortnight, Politzer believes that no advantage will result from persistence in the use of the remedy. Pilocarpine is beneficial in acute suppuration of the middle ear with perforation of the membrana tympani. It is seldom useful when the membrane remains intact and the cavity is occupied by hardened inflammatory products, though it has, in some instances, promoted their absorption. Pilocarpine is of service in dry sclerotic catarrhs of the middle ear. Politzer also employs pilocarpine locally in affections of the middle ear to which it is adapted, injecting from 6 to 8 drops of warm 2-per-cent. solution through a catheter into the Eustachian tube and tympanic cavity.

Dr. Suarez de Mendoza has, in three cases, relieved urgent dyspnœa from œdema of the glottis by hypodermic injections of pilocarpine.

The action of jaborandi upon the glands of the skin makes it useful in many cases of chronic skin disorder, especially of the dry character.

Klotz has recently reported very favorable results from the hypodermatic injection of 10 to 15 drops of a 1-per-cent. solution of pilocarpine hydrochlorate in chronic eczema. The hard, dry, and fissured condition of the skin was remarkably improved. Dr. Poulet suggests that the same procedure may be of service in the treatment of elephantiasis Arabum. In some instances jaborandi given internally has alleviated urticaria. Small doses of jaborandi by the mouth, or of its alkaloid subcutaneously, have proved remedial in hyperidrosis and bromidrosis. Pruritus is not uncommonly relieved by this agent. The itching of jaundice is amenable to the influence of pilocarpine, provided, as Waugh remarks, that the drug is well borne and sweating occurs. Dr. Robert M. Simon, of Birmingham, England, finds nothing so useful as pilocarpine hypodermically in the treatment of pruritus senilis. It affords marked relief to the itching and permits the patient to sleep.

Pilocarpus can be administered for the diseases just named as follows :—

℞ Extracti pilocarpi fl., . . . . . . . . . f℥ss.
Spiritus ætheris nitrosi,
Spiritus juniperi, . . . . . . . . . āā f℥ij.
Syrup. limonis, . . . . . . . . q. s. ad f℥vj.
M. Sig.: From a half to a tablespoonful in water every two or three hours.

℞ Infus. pilocarpi,
Infus. digitalis, . . . . . . . . . . āā f℥ij.
M. Sig.: Two teaspoonfuls every two or three hours.

By Wilkowski the hypodermic injection of pilocarpine is regarded as almost a specific in catarrhal jaundice. He attributes, moreover, a diagnostic value to the procedure. If a treatment of ten to fifteen days produces no effect upon the jaundice the presence of a malignant growth of the liver is to be suspected. For the relief of dry tongue, or aptyalism, J. P. Blackmans strongly recommends $\frac{1}{200}$ to $\frac{1}{100}$ grain of pilocarpine, inclosed in gelatin and allowed to melt on the tongue, which should be previously moistened with a little water. A moderate flow of saliva is excited within twenty-four hours, and general diaphoresis is never produced.

The dryness of the mouth often so troublesome in diabetes mellitus is relieved by the following prescription:—

℞ Pilocarpin. nitrat., . . . . . . . . . . gr. ¾.
Alcohol (40°), . . . . . . . . . . . . ♏xc.
Aq. dest., . . . . . . . . . . . . fʒij.
M. Sig.: Five or six drops of this mixture, either pure or diluted with ½ drachm of water, are dropped upon the tongue several times a day.

Pilocarpine has been found useful in the exanthemata in case of suppression or retrocession of the rash.

Pilocarpine may be used hypodermically for the same purposes as jaborandi by the stomach, and is less apt to be followed by nausea and vomiting. One-third of a grain under the skin generally causes free diaphoresis, while ½ grain produces such an amount of sweating as to lead to dangerous degree of prostration. As a rule, the first dose should not exceed ¼ grain, and in this dose it is well borne, even by subjects of heart disease. Pilocarpine is a good substitute for the Turkish and other sweating baths in the treatment of ascites and serous effusions generally, and of œdema.

Pilocarpine subcutaneously has been employed successfully in belladonna poisoning. McGowan relates a case (*London Lancet*), in which two injections of ½ grain each were undoubtedly the means of saving the patient's life. The same procedure is recommended as beneficial in acute alcoholism.

It can likewise be used with much effect in the albuminuria of pregnancy. Dr. E. L. B. Godfrey has prescribed pilocarpine very advantageously in this disease as follows:—

℞ Pilocarpinæ hydrochloratis, . . . . . . . gr. ij.
Potassii bicarbonatis, . . . . . . . . . ʒiij.
Acidi benzoici, . . . . . . . . . . . ʒj.
Tinct. cardamomi, . . . . . . . . . . f℥ss.
Aquæ, . . . . . . . . . . . q. s. ad f℥iij.
M. Sig.: A teaspoonful in water every three hours.

Pilocarpine is, however, an inappropriate remedy in œdema dependent upon disease of the heart, and should never be employed if the heart-muscle be decidedly weak and its cavities dilated. In malarial or renal dropsy, on the contrary, this alkaloid is of signal efficacy. Dr. Louis Waldstein claims favorable results in cases of enlarged lymphatic glands and lupus from the hypodermic injection of pilocarpine.

In chronic rheumatic disorders and some skin affections such diaphoretic treatment is serviceable. Muscular rheumatism and sciatica have also been ameliorated by the same method. In acute parenchymatous inflammation of the kidneys, pilocarpine is of the greatest service, increasing the urinary water and decreasing the albumin and blood. In acute scarlatinal nephritis pilocarpine is a valuable remedy, especially employed as follows:—

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|---|---|
| ℞ Extracti pilocarpi fl., | f℥ss. |
| Misturæ potassii citratis, | f℥ij. |
| Syrup. aurantii, | f℥iss. |

M. Sig.: A teaspoonful or two every three or four hours.

In uræmic accidents and puerperal eclampsia, the hypodermic injection of pilocarpine is of marked benefit. H. Mollière, of Lyons, has witnessed good results in nephritis from the application of an ointment containing from 1 to 1½ grain of pilocarpine nitrate to 3 ounces of vaseline. A stronger preparation will cause an eruption. He has found it useful in all cases except when uræmia is present.

The fulgurant pains of locomotor ataxia may sometimes be relieved by subcutaneous injection of the alkaloid, and in septicæmia it has materially modified the symptoms, even when failing to prevent death. In some instances it has proved successful in hydrophobia. Professor Ringer found the hypodermic use of full doses of pilocarpine of decided efficacy in cases of unilateral sweating.

A hypodermic injection of pilocarpine may arrest an attack of asthma, and should be given a trial in acute pulmonary œdema. A cold may be broken up by small doses of pilocarpine followed by quinine. A dose of pilocarpine will generally succeed in averting a malarial chill.

**PIMENTA** (U. S. P.).—**Allspice.**
**Dose,** gr. x–xl.

*Preparation.*

*Oleum Pimentæ* (U. S. P.).—Oil of Pimenta. *Dose,* ♏iii–v.

**Pharmacology.**—The nearly ripe fruit of Pimenta officinalis (Myrtaceæ), of Tropical America, is an aromatic stimulant, mainly used as a spice to promote appetite and digestion. It contains a volatile oil, which is also official (3 to 4 per cent.), some fixed oil, resin tannin, gum, etc. A fluid extract is also made, but is not official (dose, ♏viii–xl), and an aromatic water.

**Physiological Action and Therapy.**—Allspice is a pungent, aromatic stimulant, acting as a carminative, and stimulating the secretions of the mouth and stomach. It may be used to disguise the taste of unpalatable drugs, and is one of the ingredients of spice plasters. The oil can be added to pill-masses to prevent the griping of purgatives.

**PIMPINELLA.—Pimpernel.**

**Dose,** ♏xv–xxx.

**Pharmacology.**—The root of Pimpinella saxifraga (Umbelliferæ), growing in Europe, contains a golden-yellow volatile oil with an odor resembling that of parsley-seed, some acrid resin, and benzoic acid.

**Physiological Action.**—It exerts decided effects over mucous membranes, and is diuretic and expectorant.

**Therapy.**—Used in catarrh of various parts of the body, including gastric catarrh and bronchorrhœa. It is best given as fluid extract.

**PINUS CANADENSIS.—Hemlock Spruce.**

**Pharmacology.**—The bark of Abies Canadensis (Coniferæ) of North America is very astringent, containing large quantities of tannin and some volatile oil.

**Therapy.**—In the form of a dilute, alcoholic fluid extract it is a convenient agent to be employed where the effects of tannin are desired. It is used principally as a local astringent in pharyngitis, tonsillitis, uterine catarrh, and hæmorrhoids, applied in full strength; or it may be used diluted as a wash in leucorrhœa or gleet. This drug may be employed in diarrhœa of adults, although in such cases the prescription had better be written at once for tannic acid in the desired quantity.

**Caution.**—A white extract of Pinus Canadensis is believed to contain a certain proportion of zinc chloride, and should therefore not be taken internally, although it is useful as an external application or wash. It rapidly relieves the pain of a burn, when applied in full strength, according to Dr. W. C. Wile.

**PIPER** (U. S. P.).—**Pepper, Black Pepper.**

**Dose,** gr. ii–xv.

*Preparations.*

*Oleoresina Piperis* (U. S. P.).—Oleoresin of Pepper. *Dose,* ♏¼–j.

*Riperinum* (U. S. P.).—Piperin (a neutral principle obtained from pepper, and occurring also in other plants of the same natural order). *Dose,* gr. ss–x.

**Pharmacology.**—Pepper is the unripe fruit of Piper nigrum (Piperaceæ) of India and neighboring islands. The berries are small, pungent, and spicy to the taste, and of aromatic odor; they contain **Piperin,** volatile oil, pungent resin, fatty matter, etc. The oleoresin, extracted by ether, contains the volatile oil and acrid resin, with a little piperin. The piperin is in pale-yellow prisms, and may be contaminated with some of the volatile oil.

**Physiological Action.**—Pepper is an irritant externally and internally. Owing to its pleasant pungency it is largely used as a condiment at the table. It is decidedly stimulating to the digestive organs and to the circulation, and also to the kidneys, but to a less degree, as it passes out of the body by the urine. Pepper likewise promotes the action of the skin. If taken in excessive quantities its local action is sufficiently powerful to excite inflammation of the gastro-intestinal mucous membrane, and cases are on record in which pepper has produced delirium, rigors and convulsions.

**Therapy.**—In flatulent dyspepsia and feeble digestion pepper may be advantageously taken with the food. It is an ingredient of the Asiatic pill, which has been used in hæmorrhoids with decided benefit.

℞ Acid. arsenosi, . . . . . . . . . . gr.iij.
Piperis, . . . . . . . . . . . . ℥ss.
M. et ft. pil. no. lx.
Sig.: A pill after meals for indigestion and hæmorrhoids.

Lozenges containing pepper have also been successfully employed for the relief of hæmorrhoids, ulcers of the rectum, and fissures of the anus. Dr. Whitla suggests that cubeb be added, and the balsam of copaiba be substituted for the inert honey which enters into the formula of the British confection of pepper. He also recommends the following preparation in atonic condition of the lower bowel :—

℞ Pulv. piperis nigr.,
Pulv. carui,
Pulv. cubebæ, . . . . . . . . . . āā ℥ss.
Mel despumatæ, . . . . . . . . . . q. s.
Ft. electuarium.
Sig.: A teaspoonful three times a day.

Pepper is largely used in domestic medicine in the form of a gargle for sore throat, and is not without effect in relaxed uvula. It has also been made into an ointment, and applied with success to tinea capitis. Piperin has some antiperiodic powers, and is a good addition to a pill for chronic malaria.

## PIPERAZIN.

**Dose**, gr. v–viij.

**Pharmacology.**—Piperazin, a synthetical compound, is a piperidin in which the NH has replaced the $CH_2$ group. According to A. W. von Hoffmann, its chemical title is diethylendiamin. It occurs in the form of colorless, acicular crystals, of a pleasant taste and freely soluble in water. It is an admirable solvent for uric acid, with which it forms a neutral and very soluble salt. Experiments in the laboratory demonstrate the solvent action of a 1-per-cent. solution upon calculi, not only those composed of uric acid, but also those containing calcium phosphate, ammonium urate, etc. Piperazin urate is said to be seven times more soluble in water than lithium urate, and piperazin will render soluble twelve times as much uric acid as lithium carbonate. With hydrochloric acid it forms an easily soluble and crystallizable salt. Piperazin is a deliquescent body, and should not, therefore, be prescribed in the form of a pill or powder, but in aqueous solution.

**Physiological Action.**—Piperazin is non-toxic and unirritant to mucous membranes with which it comes in contact. It is without effect upon digestion, circulation, or respiration. This substance passes through the system unchanged, and speedily appears in the urine in a state of combination with uric acid. Piperazin has been recognized in the urine two hours after ingestion. Piperazin has no effect upon the acid reaction of that fluid, and does not increase its quantity. Wittback, however, in studying the urine of patients taking piperazin, has observed cases in which its quantity largely increased. The specific gravity was always diminished. The acidity of the urine was decreased. Piperazin does not diminish appetite or impair general nutrition.

In some experiments upon themselves, Drs. Heubach and Kuh, after taking 37 grains during the day, experienced severe headache on the following morning, and upon one occasion vomiting occurred. Tremors, hallucinations and clonic spasms have been observed by Stewart as a result of full doses of piperazin.

In two cases after the administration of piperazin Dr. Körig, of Wildungen, observed the development of albuminuria, which he ascribed to the influence of the remedy, and concludes that it should be employed with caution when the kidneys are not intact. This statement is, however, doubted by Biesenthal, who suggests that a precipitate formed by the action of picric acid on piperazin may have been mistaken for albumin.

**Therapy.**—In accordance with its chemical properties, piperazin has been found an efficient remedy in gout and various manifestations of the uric-acid diathesis. Renal and vesical calculi, due to the deposit of uric acid, have been extruded under the influence of this remedy. Piperazin is likewise serviceable by dissolving the organic matter contained in the stones. Calculi in the bladder may also be attacked by the injection of a solution of piperazin into the viscus. Dr. F. Schmey has obtained good results in chronic cystitis by the administration of piperazin in sufficient doses to saturate the urine. A solution in alcohol and water has been applied locally to gouty joints and swellings, and aids the effect of the internal administration. A combination of piperazin and phenocoll is warmly recommended by Dr. Ritter for the relief of gout. Piperazin has also been advantageously associated with phenacetin in the treatment of gout.

Dr. Eccles has employed piperazin with advantage in chronic rheumatic arthritis, and Dr. Heubach relieved lumbago by the hypodermic injection of a 2-per-cent. solution, in quantity equal to 3 grains a day. The injections gave rise to some pain, but did not cause abscesses or unpleasant after-effects. Dr. Disbrow, of Newark, N. J., saw alleviation of paræsthesia from the administration of this agent. Piperazin has proved of service in renal colic and hæmorrhage from the urinary passages. From his study of the artificial glycosuria of dogs, Hildebrandt suggested that piperazin may prove useful in the treatment of diabetes in the human subject. Piperazin was employed by Gruber in a case of diabetes, 5-grain doses being given thrice daily, the diet being at the same time properly restricted. The proportion of sugar excreted was reduced and the general condition of the patient improved. Other writers have also observed subjective and objective improvement follow the use of piperazin in diabetes.

Piperazin may be acceptably given in the form of an aërated water, 15 grains being dissolved in a quart, and the entire quantity taken during the day. It is also prescribed dissolved in distilled water and flavored with a little syrup of orange or other agreeable vehicle. Piperazin is incompatible with alkaloids and salts of iron, with tannic acid, alum, preparations of cinchona, Donovan's solution, potassium permanganate, sodium salycilate, acetanilid and phenacetin.

**Lycetol.**—A substance known for convenience as lycetol and chemically as di-methyl-piperazin-tartrate, is thought to be superior to uncombined piperazin, as the tartaric acid is claimed to split up into carbonic acid, alkalinizing the blood and dissolving uric acid. Lycetol has a diuretic effect and may be used in gout in the daily dose of 15 to 30 grains. The addition of sugar to a solution of lycetol produces a taste similar to that of lemonade.

## PISCIDIA ERYTHRINA.—Jamaica Dogwood.

### *Preparations.*

*Extractum Piscidiæ.*—Extract of Jamaica Dogwood. *Dose*, gr. ii–x.

*Pulvis Extracti Piscidiæ.*—Powdered Extract of Jamaica Dogwood. *Dose*, gr. ii–x.

*Pilula Piscidiæ.*—(Made from the extract.) *Dose*, gr. ij.

*Extractum Piscidiæ Fluidum.*—Fluid Extract of Jamaica Dogwood. *Dose*, f℥ss–ij.

**Pharmacology.**—The bark of the root of Piscidia erythrina (Leguminosæ), a tree of the West Indies, growing to the height of 20 feet, has a heavy, narcotic odor, recalling that of opium, and has a bitterish, acrid taste. It contains **Piscidin,** a yellowish, crystallizable, resinoid substance, insoluble in water, but soluble in alcohol, besides other resinous substances, oil, tannin, etc., but it has not yet been determined to which of these the physiological effects are attributable.

**Physiological Action.**—According to the experiments of Dr. Isaac Ott, Jamaica dogwood is narcotic to frogs, animals and men. It enhances the secretion of the skin, reduces the frequency of the pulse, raises arterial tension by stimulating the vaso-motor centre, the increase being soon followed by a fall due to a weakening of the heart. It causes a tetanoid state by a stimulant action upon the spinal cord. Jamaica dogwood likewise causes dilatation of the pupil, followed by contraction as asphyxia develops. It causes death by either heart-failure or, what is more frequent, by arresting respiration. Pitcher has observed several cases in which alarming symptoms supervened from 8-drop doses every three hours. Jamaica dogwood, used medicinally in suitable doses, will not diminish the appetite or cause constipation. It is seldom followed by nausea, headache, or other unpleasant effect.

**Therapy.**—Jamaica dogwood, in hæmorrhoids, has been successfully used locally in conjunction with lead acetate. A cloth saturated with the fluid extract has been found efficient in superficial burns and scalds. Flagg states that the fluid extract of Jamaica dogwood has been found to possess decided value as a local and systemic analgesic. In general practice this combination of effect is frequently desirable, and in dental practice it will be recognized as especially valuable in treatment of periodontitis, alveolar abscess, pulp irritation, and other painful conditions within the oral cavity, as topical applications, with directions to swallow the saliva, promptly induce relief. Flagg also recommends 5 to 10 drops of the fluid extract given at the same time, in the diseases named, every hour or so as required.

Internally, Jamaica dogwood allays pain, relaxes spasm, quiets reflex excitability, and promotes sleep. It is consequently well adapted to act as a substitute for opium, especially when, as is not infrequently the case, the latter drug is not well borne. In the various forms of neuralgia, including sciatica, Jamaica dogwood has proved of value. Gastro-enteralgia, consequent to typhoid fever, has been also notably relieved by it. In the lancinating pains of locomotor ataxia it has, however, proved inefficient. Dr. Liégeois has found this drug of service in allaying the continuous cardiac pain due to arterio-sclerosis. When angina pectoris has developed he considers Jamaica dogwood to possess a certain prophylactic power by virtue of its sedative effect upon the circulation. As synergestic drugs he sometimes combines aconite and veratrum viride:—

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|---|---|
| ℞ Tinct. piscidiæ, . . . . . . . . . . | f℥ss. |
| Tinct. veratr. virid, . . . . . . . . . | f℥ss. |
| Tinct. aconit. rad., . . . . . . . . . . | fʒiiss. |

M. Of the above mixture he gives, during one-third of the month, 30 drops three times a day, placing his patient, for the remainder of the month, upon sodium iodide.

In pelvic neuralgia, the pain produced by fibroma of the uterus, and in dysmenorrhœa, piscidia has been found of much service. This remedy is likewise able to quell the pains of false labor and of threatened abortion, in which, and in dysmenorrhœa, it is well combined with viburnum prunifolium, as:—

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|---|---|
| ℞ Extract. piscidiæ fl., | |
| Extract. viburni prunifol. fl., | |
| Syrupi aurantii, . . . . . . . . . . | āā f℥j. |

M. Sig.: A teaspoonful, to be repeated every hour or two.

The pain due to a fractured bone may be ameliorated by administrations of this agent, which is also beneficial in acute or chronic rheumatism. The pains of inflammation may likewise be ameliorated by Jamaica dogwood. In panophthalmitis, iritis, irido-cyclitis, and in acute abscess of the auditory meatus, it is also capable of relieving the suffering. The pain of carcinoma has been assuaged by this remedy, which may here not infrequently replace opium with advantage. On account of its antispasmodic virtues it is of considerable service in alleviating the paroxysms of asthma and whooping-cough, and cases of chorea have been reported in which it proved of benefit.

It is also beneficial to coughs of reflex origin, of bronchitis and of pulmonary tuberculosis. Hysterical convulsions have yielded to the influence of this drug. Piscidia quiets restlessness and delirium, and induces sleep in delirium tremens, or mania-a-potu, and has been employed with gratifying success in the insomnia of insane patients. In insomnia, however caused, this agent fulfills an excellent service. Uterine colic and cholera morbus likewise prove amenable to its action.

## PIX BURGUNDICA (U. S. P.).—Burgundy Pitch.

### *Preparations.*

*Emplastrum Picis Burgundicæ* (U. S. P.).—Burgundy Pitch Plaster.

*Emplastrum Picis Cantharidatum* (U. S. P.).—Cantharidal Pitch Plaster. Warming Plaster.

**Pharmacology and Therapy.**—Burgundy pitch is the prepared, resinous exudation of Abies excelsa (Coniferæ), a tree of Southern Europe. It is a resin with traces of volatile oil. It has some balsamic properties, and is slightly irritating to the skin. In exceptional instances its local action is severe, and it gives rise to vesicles and pustules, or even produces ulceration. The official plasters are mild counter-irritants. The warming plaster is useful in chronic rheumatic swellings and in affections of the chest. Burgundy pitch has been thought to have some special action upon the rectum, and for this reason has been given in hæmorrhoids, made into a pill with tar. Burgundy pitch also enters into plasters of galbanum, of iron, and of opium.

Dr. L. M. Houser observed a case of intoxication in a child, 8 years of age, who had eaten a small quantity of the exudation from the tree. The symptoms were extremely dilated pupils, mental excitement with hallucinations, and frequent micturition. The patient recovered, but the pupils remained somewhat dilated for several days.

### PIX CANADENSIS.—Canada or Hemlock Pitch.

#### *Preparation.*

*Emplastrum Picis Canadensis.*—Hemlock Plaster (Canada pitch, 9 parts; yellow wax, 1 part).

**Pharmacology.**—The prepared resinous exudation of Abies Canadensis (Coniferæ) contains resin and a trace of volatile oil. The uses are similar to the preceding.

### PIX LIQUIDA (U. S. P.).—Tar.

#### *Preparations.*

*Syrupus Picis Liquidæ* (U.S. P.).—Syrup of Tar. *Dose,* f ʒ i–ij.
*Unguentum Picis Liquidæ* (U. S. P.).—Tar Ointment.
*Vinum Picis* (N. F.).—Wine of Tar (a saturated solution in sherry wine). *Dose,* f ʒ i–iv.

**Pharmacology.**—Tar is an empyreumatic oleoresin, obtained by the destructive distillation of the wood of Pinus palustris and other species of pinus (Coniferæ) of Europe and America; that coming from North Carolina and Sweden is the best. It should be free from mechanical impurities. It contains oil of turpentine, pyrocatechin, acetic acid, acetone, methylic acid, xylol, creosote, phenol, etc., and is blackened by wood-smoke. Tar is soluble in less than its own bulk of alcohol or chloroform, is slightly soluble in olive-oil or oil of turpentine. By distillation it yields an acid liquor called pyroligneous acid, and an empyreumatic oil, called oil of tar, which is official. The oil has but little color when fresh. It deepens with age to a dark reddish brown. It is a volatile fluid, of acid reaction, has the odor and taste of tar and is soluble in alcohol. What is left behind is **Pitch,** which is a black solid, presenting a shining, fractured surface, melts in boiling water, and consists of resin with various empyreumatic resinous products, which have collectively received the name of **Pyretin.** The creosote of tar is of special interest on account of its antiseptic and preservative properties, from whence it derived its name.. The creosote of beechwood is used largely in medicine.

**Lysol,** a new tar combination, is derived, according to Gerlach, from tar-oils by boiling with alkalies and fats. It possesses the consistency of soft, or potash, soap, is of a brownish color, contains 50 per cent. of cresols and is readily soluble in water.

**Physiological Action.**—Tar is an irritant, and is liable to produce a papular eruption upon the skin if applied too freely; its use internally is also sometimes provocative of erythema, vesicles or papules, accompanied by severe itching. It is absorbed readily, so that when a large surface is exposed to its action, feverish symptoms, blackish urine, and symptoms of carbolic-acid poisoning may ensue. The stools become blackish, and, as well as the urine, possess the odor of tar. Epigastric pain, vomiting, severe headache, or a sense of oppression in the head may also occur. Tar has an astringent effect upon mucous membranes. It has decided antiseptic power. When tar is taken internally, small doses exert a stimulating effect upon the circulation and secretory apparatus. Large, or too long continued, doses destroy appetite and impair digestion, depress the action of the heart, and cause nervous exhaustion. Taylor instances a fatal case caused by the accidental ingestion of the oil of tar. Large quantities of tar itself have sometimes been known to be taken without fatal consequences.

**Therapy.**—Tar is a good application to scaly skin diseases, such as psoriasis, but the official ointment is liable to cause irritation and should be diluted when used:—

℞ Ung. picis liquid., . . . . . . . . . . ʒij.
Ung. zinci oxidi, . . . . . . . . . . ʒvj.
M. For the relief of itching in chronic eczema.

Tar ointment has been used with success in scabies and tinea. It is necessary, always, to be careful in applying tar, as it may excite dermatitis or an acne-like eruption which Hebra called "tar-acne." Tar ointment is of value in prurigo, and is sometimes capable of lessening this notoriously rebellious affection. Pruritus ani is often allayed by a weakened tar ointment.

In the treatment of hæmorrhoids Dr. Lacruz recommends a preparation composed of:—

℞ Picis liq.,
Extr. belladonn. folior. alc., . . . . . . . āā gr. xlv.
Glycerit. amyli., . . . . . . . . . . ℥j.
M. Sig.: Apply morning and night.

Tar ointment, either in full strength or modified, is serviceable in lichen, comedo, sycosis, pemphigus, lupus erythematosus and vulgaris. In order to prepare an unirritant tar ointment Stern advises that the tar be previously allowed to stand for several weeks in a warm place. It will be found that it separates into two layers, the upper of which is thin and syrupy, while the lower is thick and often mixed with small solid particles. The upper layer is destitute of irritant properties. An alkaline tar-water, made by adding tar fʒij, caustic potash ʒj, to water f℥v, is a useful agent in the treatment of eczema. Lysol, the tar combination, is said by Gerlach to be a good disinfectant and antiseptic. He advises lysol to be employed, in from ½- to 1-per-cent. solution, whenever an antiseptic or aseptic operation is desired. It is more easy of application than soap and disinfectant fluids, and removes dirt, fatty matter, etc., from the skin and instruments. Lysol has the advantage of being odorless and comparatively innocuous. Michelson has found it useful as a wash in major and minor gynæcological operations. In laparotomies he made use of a 1-per-cent. solution for all purposes except irrigation of the peritoneal cavity, for which a 0.3-per-cent. solution is sufficiently strong. The weaker solution is also of service in obstetrical practice. A gauze saturated in a 5-per-cent. solution removed the odor of cancer of the cervix. This agent promotes the granulation of wounds. Catgut immersed for two hours in a 5-per-cent. solution became as hard and resistant as if it had been treated by alcohol or oil of juniper. Lysol is likewise well adapted for use as a disinfectant in the sick-room or hospital ward, schools, etc., and wherever such an agent is required.

Lysol is capable of causing toxic manifestations, as in a case reported by Dr. Reich. The application of pure lysol to a large part of the body of a young man was followed by loss of consciousness and convulsions, violent inflammation of the skin and the appearance for two days of albumin in the urine. On the other hand, Dr. Potjan records a case in which a teaspoonful of lysol was swallowed by mistake without evil consequences.

Lysol has been used with satisfactory results in some cases of lupus. Lysol has likewise been successfully employed in gonorrhœa of the male by Dr. V. Carvollo in the form of a 1-per-cent. solution injected into the urethra three times a day to begin with, and less frequently as the discharge is arrested. Professor Parvin states that in cystitis of the female injections of a ½-per-cent. lysol solution give good results. Dr. Haug recommends irrigation with a 1-per-cent. solution in the treatment of otorrhœa. A 1-per-cent. solution in ozæna, a 2-per-cent. solution in eczema, and a ½-per-cent. solution in tonsillitis have been used with benefit. The use of about a pint of a 1-per-cent. solution as an enema three times daily has been found of service in dysentery. Lysol has been administered with advantage internally in dyspepsia in doses from ¾ grain to 8 grains after each meal. The taste may be disguised by essence of peppermint.

**Pixol.**—Another disinfectant prepared from tar is termed pixol. It was devised by Dr. Raptchevski, and has the special merit of being exceedingly cheap. Pixol is made by dissolving a pound of green soap in 3 pounds of tar and slowly adding a solution of a little more than 3½ ounces of either potash or soda dissolved in 3 pounds of water. The result is a syrupy fluid which, in 5-per-cent. dilution is used for disinfecting linen and washing the hands. A 10-per-cent. solution is an efficient disinfectant of dejecta. A solution of the latter strength is said to be fatal to the micro-organisms of suppuration, anthrax, typhoid fever, and cholera.

**Pix solida,** or pitch, is used externally in plasters. It is entirely different from the residue of coal-tar or "gas-pitch."

A tar-water (made by mixing 1 part with 4 parts of water) was formerly official. It is a sherry-colored, slightly-acid liquid, having a strong odor of tar. It may be used with an atomizer or vaporized by heat in chronic catarrhal disorders of the air-passages. Ringer and Murrell have demonstrated the usefulness of tar in winter cough, and have ascertained that it materially lessens the tendency to taking cold. Dr. Phillips finds it of service in chronic plumonary tuberculosis ; it improves appetite and digestion, checks diarrhœa, and quiets cough. A tar-water made with tar and lime-water, and percolated through powdered wild-cherry bark, is highly esteemed by H. C. Wood in chronic diarrhœa. The tar-water spray is beneficial in pharyngitis and laryngitis. It is also an efficient antiseptic application to unhealthy wounds or ulcers. Tar is likewise taken internally for the same class of diseases for which terebinthinate preparations are usually prescribed. Pills containing 1 or 2 grains are useful in winter cough and other bronchial disorders. In many chronic skin disorders the internal administration of tar is a valuable adjunct to local treatment. McCall Anderson speaks favorably of the action of small doses of tar, taken internally, in both psoriasis and chronic eczema.

In ozæna, Moire recommends a combination of :—

| | | |
|---|---|---|
| ℞ | Pulv. camphor., . . . . . . . . . | ʒjss. |
| | Tr. iodi., . . . . . . . . . . | fʒiij. |
| | Potass. iodid., . . . . . . . . . . | ʒss. |
| | Picis liquid., . . . . . . . . . . | fʒiiiss. |
| | Alcohol (90°), . . . . . . . . . . | f℥iij. |
| | Aquæ, . . . . . . . . . . . | f℥vj. |
| M. | | |

The mixture is placed upon a water-bath and the fumes are inhaled for two or three minutes. The nasal chambers are then cleansed with a spray of 1-per-cent. carbolized water.

## PLANTAGO.—Plantain.

**Pharmacology and Therapy.**—The leaves of plantain (Plantago major and lanceolata, N. O. Plantaginaceæ) are used as a vulnerary, the fresh leaves being pounded in a mortar into a paste and applied to wounds to check bleeding. In rhus poisoning, burns, scalds, bruises, and even erysipelas, it is said to be extremely efficient. An infusion may be administered internally, or a fluid extract may be given in doses of ♏v–fʒj. It does not appear in Prof. Laurence Johnson's "Medical Botany of the United States," and probably has very little therapeutic merit.

## PLUMBUM.—Lead.

### *Salts and Preparations.*

*Plumbi Oxidum* (U. S. P.).—Lead Oxide, Litharge.

*Emplastrum Plumbi* (U. S. P.).—Lead Plaster, Diachylon Plaster.

*Unguentum Diachylon* (U. S. P.).—Diachylon Ointment.

*Liquor Plumbi Subacetatis* (U. S. P.).—Solution of Lead Subacetate, Goulard's Extract.

*Liquor Plumbi Subacetatis Dilutus* (U. S. P.).—Diluted Solution (3 per cent.).

*Ceratum Plumbi Subacetatis* (U. S. P.).—Goulard's Cerate (20 of Goulard's Extract to 80 parts of camphor cerate).

*Linimentum Plumbi Subacetatis.*—Liniment of Lead Subacetate (40 to cotton-seed-oil 60 parts).

*Plumbi Acetas* (U. S. P.).—Lead Acetate, Sugar of Lead. *Dose*, gr. i–iv.

*Plumbi Carbonas* (U. S. P.).—Lead Carbonate.

*Unguentum Plumbi Carbonatis* (U. S. P.).—Ointment of Lead Carbonate (10 per cent.).

*Plumbi Iodidum* (U. S. P.).—Lead Iodide. *Dose*, gr. $\frac{1}{12}$–$\frac{1}{4}$.

*Unguentum Plumbi Iodidi* (U. S. P.).—Ointment of Lead Iodide (10 per cent).

*Plumbi Nitras* (U. S. P.).—Lead Nitrate. Used as a disinfectant. Ledoyen's solution is a solution in water, ʒj to f℥j.

*Plumbi Oxidum Rubrum.*—Red Lead.

*Plumbi Chromas.*—Lead Chromate, Yellow Pigment.

**Pharmacology.**—Metallic lead is readily affected by the oxygen of the air or by carbonic acid of water, and, although not poisonous itself, its salts are all deleterious, even in small amounts. Lead is therefore not a suitable lining for a reservoir for drinking-water, and lead pipes should not be used for conveying water for household purposes unless lined with tin. White lead and red lead are largely used both by painters and plumbers, who are liable to be affected owing to absorption through the skin. Lead chromate is a yellow pigment used as a protective applied to the covers of hams, and is also sometimes fraudulently used by bakers to color cake, in order to make up for a deficiency of eggs. Lead acetate is astringent and sweetish, and has been swallowed by mistake for other drugs, such as magnesium sulphate. Fortunately, it is irritant to the stomach and acts as an emetic, but, if retained long enough to be absorbed, coma or paralysis may ensue. Sugar of lead has also been used in clarifying cider; and earthen vessels are glazed with a flux containing lead, so that the sources of lead poisoning are numerous. A case of lead poisoning in a young infant has been reported, caused by the mother's cleaning out the nursing-bottle with lead shot. Poisoning has also occurred from the use of cosmetics and hair-dyes containing lead. Lead is sometimes present in flour by reason of the mill-stones, by which the grain was ground, having been repaired by filling their cracks with lead. Numerous cases of lead poisoning have thus originated. Chronic lead poisoning has been produced in children by the tin-foil in which certain kinds of candy are wrapped. It has been proved that some of this tin-foil contains lead in large amount. A number of trades and occupations necessitate the handling of articles containing lead and, therefore, give rise to cases of poisoning. Some persons are so susceptible that simply sleeping in a newly painted room will impregnate the system. Inhalation of the smoke given off by burning painted wood may also cause intoxication.

**Symptoms and Treatment of Lead Poisoning.**—Acute lead poisoning following a single large dose of one of the salts of lead is very rare; but acute attacks as the result of slow absorption of the drug are very common. The most striking symptoms are obstinate constipation with cramps ("dry gripes"), loss of appetite, nausea, and vomiting of white, curd-like material, the color being due to the formation of lead chloride with the hydrochloric acid of the gastric juice. If the bowels open, the passages are of a blackish hue from the presence of sulphide of lead. The abdominal muscles are rigid and knotted and the wall of the abdomen is, in consequence, retracted. The intestines are shrunken, tenesmus is frequent, and alternate contraction and relaxation of the rectum can sometimes be felt. The liver is retracted and may even be diminished in size. The pulse is generally hard and tense on account, as Harnack supposes, of spasmodic contraction of the intestinal bloodvessels. Vertigo or headache may occur, and neuralgic attacks; even stupor and convulsions. Upon examination of the mouth, a **blue line** will be found in the gums near their margin, over the incisor teeth, caused by a deposit of the metal, or its sulphide, in the tissues. This line is particularly noticeable in those who neglect the care of their teeth. In some instances the conjunctiva becomes yellowish. Not infrequently there is redness and swelling of various joints. In rarer cases asthma or visceral disease has been produced by the absorption of lead. Various forms of paralysis may occur, the most common being "wrist drop," or extensor paralysis of the muscles of the forearm. Electro-muscular contractility is early affected and may be lost before the power of voluntary movement. As a rule, the paralysis affects both wrists, the integument of which is frequently anæsthetic. Loss of sensibility may also occur at a distance from the paralyzed parts. Strabismus and aphonia have occurred and some cases have had a fatal termination from paralysis of the respiratory muscles. In some instances deafness is one of the results of saturnine intoxication. Hyperæsthesia or anæsthesia of the integument may be produced. A fatal case of lead poisoning has been reported* by Dr. G. L. Walton, in which ataxia was the prominent symptom. Three similar cases have been published by Dr. J. J. Putnam. Among the symptoms attending **plumbism**, or saturnism, are an offensive odor of the breath, pallor, emaciation, muscular pains, and loss of power. Plumbism is the frequent cause of abortion. The wives of workmen in lead factories frequently abort, even when they are not directly exposed to the influence of the metal. According to the investigations of M. Paul, of fifty children born alive, nearly all died within a few years after birth and only fourteen reached the age of ten years. Amenorrhœa likewise occurs among women exposed to the influence of lead.

More or less complete amblyopia may develop slowly or suddenly and may be associated with inflammation or atrophy of the optic nerve. Amaurosis and a train of nervous phenomena dependent upon alterations occurring in the brain (lead encephalopathy) appear from the influence of lead. A valuable memoir on the subject of cerebral symptoms due to lead intoxication has been published by Dr. Westphal.† Four forms have long been recognized under which the effects of the metal upon the brain are manifested,—the delirious, comatose, convulsive, and composite. The last named is by far the commonest, and in it the characters of the other three varieties appear to be united. Apoplectic and chorea-like forms have likewise been observed. Progressive paralysis, paresis of the laryngeal muscles, and a peculiar variety which runs a typhoid course have been described by different writers. From a careful study of thirteen cases, Westphal divided them into those which present general cerebral symptoms and those showing symptoms due to pressure. The first group were characterized by depressed spirits, dementia associated with melancholia, hypochondriasis, irritability, headache, and vertigo. Convulsions were very common, at times general, and again limited to certain groups of muscles. In five cases the spasms assumed a genuine epileptic character. Among pressure symptoms, the most frequent was paresis in districts supplied by certain cranial nerves. Disturbances of smell and vision, circulation and respiration, hemianæsthesia, and hemiparesis were observed. The author finally enumerates four modes in which lead acts upon the central nervous system: (1) by direct influence upon the brain, producing neurosis of various kinds, disturbances of intellection, and symptoms due to structural change; (2) by influence upon the blood-vessels, leading to hæmorrhage and softening; (3) by influence upon the kidneys, resulting in the cerebral symptoms af anæmia; (4) by a combination of the preceding methods.

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* *Boston Medical and Surgical Journal*, October 30, 1890.

† See summary of his paper in the *Medical Bulletin*, August, 1889, p. 251, from *Deutsche Medizinal Zeitung*, May 9, 1889.

According to experiments suggested by Professor Thomas Oliver, hyrochloric acid is the active agent in promoting absorption of lead by the stomach. Pepsin rather diminishes than increases the amount of lead dissolved. The presence of proteids in gastric digestion also considerably reduces the quantity. Bile dissolves three times as much lead as the gastric juice. The presence of fat, however, reduces the quantity of the metal which passes into solution. The pancreatic fluid has no influence upon lead, whether alone or mixed with peptones, fat or starch.

In obscure cases, suspected to be due to the influence of lead, the diagnosis may be positively made by means of a chemical examination of the urine for the presence of the metal.

Chorea, neuralgia, and spinal disease have also been observed in chronic intoxication from lead. Cirrhosis of the liver, inflammation of the parotid gland, atrophy of the intestines, arthralgia and contracted kidneys have also been due to the same influence. Acute and chronic asthma are also among the results of this species of poisoning. Facial palsy has been met with, and Dr. Putnam asserts that in children suffering from the effects of lead the legs and feet are generally paralyzed. In all doubtful cases the urine should be carefully examined for the metal.

The post-mortem examination reveals chronic catarrh of the gastro-intestinal tract, thickening of the walls of the smaller arteries, interstitial inflammation of the kidneys, with the deposit of lead in the nerve-centres, and, in fact, in every part of the body. The lead, according to the experimental researches of Prevost and Binet, accumulates especially in the kidneys, though they have found it in most of the organs and tissues of the body. The longer the course of poisoning, the more lead is contained in the kidneys. The metal may be found in these organs long after the administration of the poison has ceased. The bones also were rich in lead, which was stored up in the form of a phosphate. The principal cerebral lesions of lead encephalopathy are atrophy of certain regions, hæmorrhagic depots, apoplectic cysts, and, above all, alterations in the cerebral vessels, such as endo- and peri- arteritis, atheroma, and hyaline degeneration. Chronic plumbic intoxication is very apt to lay the foundation of kidney disease.

**Physiological Action.**—Given in medicinal doses, lead salts are sedative, astringent, and hæmostatic. They enter the blood, slow the heart and respiration, interfere with the nutritive functions of the red blood-corpuscles, and lead to their destruction, thus causing anæmia. Lead escapes from the blood by the skin, the liver, the kidneys, and intestinal tract. It is also found in the lacteal secretion. The excretion of uric acid is reduced, and thus lead favors the occurrence of gouty attacks in those predisposed. The excretion of urea is likewise diminished. The intemperate use of alcohol determines attacks of plumbism upon exposure. Persons working among white lead may escape lead poisoning by using sulphuric-acid lemonade and fatty articles of food, and by frequent bathing. Sulphuric acid forms an insoluble compound with lead. In lead colic we may give 20 to 40 grains of magnesium sulphate with $\frac{1}{6}$ to $\frac{1}{4}$ grain of morphine, with syrup of ginger, and water enough to make a tablespoonful every hour or two to relieve pain and constipation. Belladonna, or atropine, has also been found efficient in relieving the pain, while Bardenhewer recommends pilocarpine as rapidly accomplishing the same purpose. Alum is of value in the treatment of chronic lead poisoning. Where the lead is in the tissues, it may be slowly removed by the administration of small doses of potassium iodide, and by vapor baths or Turkish baths, keeping up also the action of the kidneys. Baths containing potassium sulphide are also recommended. In the treatment of progressive saturnine paralysis strychnine is of decided worth. Professor Oliver uses ferrous iodide if the patient is anæmic. Lithia, though of little avail as regards subduing pain, increases the amount of urine. For attacks of acute lead encephalopathy this writer finds no treatment so efficacious as inhalation of amyl nitrite, which quickens the pulse, reduces arterial tension and arrests convulsions. In suppression of the urine he recommends pilocarpine. M. Lavrand also recommend ferrous iodide, either alone or associated with zinc phosphide as of value in arresting the progress of plumbism. The practice of massage favors the elimination of lead and the galvanic current is also of efficacy.

In some persons the topical application of solutions containing lead will cause brownish or blackish discolorations of the skin. Used internally the preparations of this metal may occasion erythema or petechiæ.

**Therapy.**—Lead is used locally in the form of metallic plates in the treatment of leg-ulcers, with good effect, to repress exuberant granulations. Lead nitrate is employed in onychia with good result. As Goulard's solution, or cerate, it is applied to erysipelas, acute eczema, contusions, and inflammations of various kinds, but should be diluted. The early application of Goulard's solution is occasionally able to abort a felon. This liquid will often relieve itching, and is therefore of avail in paræsthesia and urticaria. Lead-water with laudanum was formerly much used to relieve pain and inflammation:—

| | |
|---|---|
| ℞ Liq. plumbi subacetatis, | f℥j. |
| Tr. opii, | f℥ij. |
| Aquæ destillatæ, | f℥v. |

M. For external use.

Lead acetate is used for the same purpose, and also as an injection for gonorrhœa or leucorrhœa:—

| | |
|---|---|
| ℞ Plumbi acetatis, | gr. xij. |
| Zinci sulphatis, | gr. viij. |
| Aquæ rosæ, | f℥iij. |

M. Sig.: Use as an injection every six hours for gonorrhœa or gleet.

| | |
|---|---|
| ℞ Plumbi acetatis, | gr. x. |
| Glycerini, | f℥ss. |
| Aq. hamamelidis dest., | f.℥j. |
| Aquæ dest., | f℥iss. |

M. Sig.: For injection.

| | |
|---|---|
| ℞ Plumbi acetatis, | gr. viij. |
| Acidi carbolici, | ♏ij. |
| Glycerini, | f℥ss. |
| Aquæ rosæ, | f℥iiiss. |

M. Sig.: For injection.

In many acute and chronic diseases of the skin the various lead salts are most useful on account of their soothing and astringent action. The following formulæ are suggested:—

| | |
|---|---|
| ℞ Plumbi acetatis, | gr. x vel xx. |
| Morphinæ sulphatis, | gr. v. |
| Mentholi, | gr. x. |
| Creosoti, | ♏x. |
| Pulveris marantæ, | ʒj. |
| Ungt. zinci oxidi, | ℥j. |

M. For subacute and chronic eczema.

| | |
|---|---|
| ℞ Plumbi carbonatis, | ℥ss. |
| Creosoti, | ♏x. |
| Ol. olivæ q. s. ft. ungt. mollis, | |

M. Useful in erysipelas, burns, and in bruises, especially when the skin assumes a blue or a dark tinge.

| | |
|---|---|
| ℞ Plumbi carbonatis, | ʒij. |
| Zinci carbonatis, | ʒss. |
| Ol. eucalypti, | ♏v. |

M. A serviceable dusting-powder in acute eczema, herpes, and seborrhœa.

In conjunctivitis, dilute lead-water was formerly much used, but if ulceration of the cornea exist it may cause a permanent white patch. In diarrhœa and sporadic cholera, lead acetate and opium pills are of great service; and the acetate, in doses of gr. ss-iij, is valuable in internal hæmorrhage or hæmoptysis.

**Special Forms.**—The glycerin of lead subacetate of the British Pharmacopœia is a good application to eczema. It corresponds in strength to Goulard's solution, but has glycerin as the menstruum. The liniment of the subacetate is a good astringent application to inflamed skin, chapped hands, and bruises. White-lead paint (without turpentine) is a good application to a burn or scald where the skin is unbroken. The ointment of lead iodide is used as a resolvent on glandular swellings, scrofulous tumors, goitre, etc., and also as an application in acne and other skin diseases. Dr. C. D. F. Phillips states that this ointment is especially serviceable in acute mastitis with threatened suppuration. It should be applied with steady friction. Chronic synovitis has likewise been benefited by the same preparation.

Lead nitrate, in dilute solution, is useful in ozæna as a wash, also in leucorrhœa, and to correct the fetid odor of discharges from ulcers, etc. Fissures of the nipples are cured by applications of a 2-per-cent. solution in glycerin. The oleate of lead, melted with an equal amount of lard-oil, is a useful application in eczema, acne, etc. Lead plaster is employed by surgeons to protect parts of the body exposed to chafing by splints or apparatus; it is also good to prevent bed-sores and as a base for other plasters. Hebra's diachylon ointment* is made by melting equal parts, by weight, of lead plaster and linseed-oil, to which a proportion of balsam of Peru and a little oil of lavender are sometimes added. Diachylon ointment is serviceable in hyperidrosis. It should be spread upon pieces of linen large enough to cover the foot and separate pieces placed between the toes. The foot is then covered with linen and bandaged, and this procedure is repeated every day for one or two weeks. This ointment often proves an excellent application also in subacute and acute eczema. In seborrhœa, dermatitis, herpes zoster, and sycosis, the use of lead ointment is attended with good results.

In the treatment of the muscular weakness or paralysis following the absorption of lead, besides potassium iodide and occasional purges of magnesium sulphate, with hot baths, etc., it is necessary to employ galvanism, to keep up the nutrition of the muscles and prevent fatty degeneration, and to employ systematic exercise, with massage. Semmola and others have published the details of a method by which the continuous current was successfully employed according to a systemic—as opposed to local—method, the poles being applied to the tongue and pit of the stomach. The sole reliance was placed upon galvanism, and no potassium iodide was employed. The blue line upon the gums disappeared at the end of about three weeks, and at the same time the muscles began to be capable of feeble movements. The method proved of no avail when cerebral symptoms were present.

Lead acetate fulfills a double purpose in the treatment of gastric ulcer. It checks hæmorrhage and at the same time promotes cicatrization. In the diarrhœa of typhoid fever and phthisis, this salt is an excellent remedy, and can be prescribed with service thus in ordinary diarrhœa, as well as in that from phthisis:—

℞ Plumbi acetatis,
Pulv. ipecacuanhæ et opii, . . . . . . . āā gr. xxiv.
M. et ft. chartæ. no. xij.
Sig.: A powder every hour or two.

℞ Plumbi acetatis, . . . . . . . . . . ʒj.
Tinct. opii, . . . . . . . . . . f℥ij.
Tinct. catechu, . . . . . . . . . f℥j.
Syr. zingiberis, . . . . . . . q. s. ad. f℥iij.
M. Sig.: One to two teaspoonfuls in water every hour or two for diarrhœa. The dose for a child from two to six years old, from ten to thirty drops.

The acetate possesses some power, likewise, over the night-sweats of pulmonary disease. It is of service in chronic gastric catarrh and diminishes the copious secretion of chronic bronchitis. Asthma associated with chronic bronchitis and the catarrhal stage of pertussis are relieved by the same preparation. Lead acetate has been found beneficial in dysentery, given either by the mouth or in the form of suppositories, as follows:—

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* An improved process for making Hebra's diachylon ointment is given by Deringer: Dissolve lead acetate 200 grammes in 1 litre of distilled water and mix with 300 grammes of white castile-soap previously dissolved in 1½ litres of warm, distilled water. Filter both solutions before mixing. The precipitate is then washed with water, freed as much as possible from water by kneading, and 1 part is melted with 1½ parts of olive-oil on the warm bath. The mixture is then triturated in a mortar until it forms a fine, white salve.—Proceedings Am. Pharm. Association, 1881, p. 63.

℞ Plumbi acetatis,
Camphoræ, . . . . . . . . . . . āā ʒss.
Extracti opii, . . . . . . . . . . . gr. iiss.
Ol. theobromatis, . . . . . . . . . . q. s.
M. et ft. suppositoriæ no. x.
Sig.: Insert one into the bowel every hour or two for severe diarrhœa and dysentery, especially when attended with tenesmus.

Lead acetate is useful in hypertrophy of the heart on account of its power of retarding the action of that organ. From its influence upon the heart and its astringency, it is sometimes employed in the treatment of internal aneurism. Trocy advocates its use in pneumonia, especially when that disease attacks drunkards or persons of depressed vitality. He claims that the temperature and rate of respiration are lowered, and the disease is prevented from passing into a chronic form.

Lead iodide has been administered internally in order to reduce enlargement of the spleen due to malaria.

## PODOPHYLLUM (U. S. P.).—Podophyllum, May-Apple, Mandrake.

### *Preparations.*

*Extractum Podophylli* (U. S. P.).—Extract of Podophyllum. *Dose*, gr. ii–iv.

*Extractum Podophylli Fluidum* (U. S. P.).—Fluid Extract of Podophyllum. *Dose*, ♏xxx.

*Resina Podophylli* (U. S. P.).—Resin of Podophyllum. *Dose*, gr. $\frac{1}{8}$–j.

*Podophyllotoxin.* *Dose*, gr. $\frac{1}{10}$–$\frac{1}{6}$.

**Pharmacology.**—The rhizome and rootlets of Podophyllum peltatum (Berberideæ), growing in United States and Canada, possess valuable medicinal properties. This plant contains about 4 per cent. of resin, which is a mixture of **Picropodophyllin, Podophyllinic** and **Pyrocatechuic acids, Podophylloquercitin** (the coloring principle), with **Saponin, gum, starch,** gallic acid, fixed oil, salts, etc. It contains no alkaloidal principle. According to Podwissotzky, the active principle is a neutral crystalline body, picropodophyllin, which exists in combination with an inactive resin-acid called picropodophyllic acid, and the resulting combination he named **Podophyllotoxin**; it is a bitter, white, resinous powder, soluble in weak alcohol and in hot water, but is precipitated from alcoholic solution by cold water in excess. The official resin of podophyllum consists of two resins, one soluble both in ether and in alcohol, the other only in alcohol. The former, comprising from 75 to 80 per cent., is the active part, the other being without any effect, according to Cadbury. The resin is very irritant to the eyes, and when handled the dust is apt to cause conjunctivitis. The resin of podophyllum is insoluble in benzol, like that of jalap and scammony, but differs from these in being soluble in alkaline solutions, from which it may be precipitated by acids.

A Himalayan plant, **Podophyllum emodi,** has been proposed as a source of the official resin. The analyses of John C. Umney show that although it yields nearly double the amount of resin which can be extracted from podophyllum peltatum, the resin, nevertheless, contains only about half the quantity of crystalline picropodophyllin, the active principle of the drug.

**Physiological Action.**—Podophyllum is a slow cathartic, acting upon the liver and the intestinal glands. It also exerts its purgative effects when introduced into the blood; also by absorption, when applied to a raw surface. In small doses it is laxative, in large doses drastic, and may cause gastro-enteritis. Podophyllotoxin has lately been isolated in a pure, crystalline form, and Neuberger has made an experimental study of its physiological action. Upon frogs and rabbits it has but little effect. Cats, however, proved extremely sensitive to its influence. Severe vomiting and diarrhœa occurred in a few hours after its administration. As death approached the animal became apathetic and paretic, and the temperature fell. Similar effects were produced in dogs. After death there was found great irritation, or even abscess, at the point of injection. The mucous membrane and adenoid tissue of the intestines were congested or inflamed; the liver and kidneys were swollen. Neuberger, therefore, concludes that the substance acts simply as an irritant, exciting catharsis in its elimination by the intestinal glands.

**Therapy.**—On account of the smallness of the dose and slight taste of podophyllotoxin, or the resin, it is very applicable to the treatment of constipation of young children, or the opposite condition of diarrhœa from want of proper secretion. A grain may be dissolved in spirit of ginger, and a drop or two given on sugar. Proper caution, however, must be exercised in giving podophyllum or its constituents to children, as fatal accidents have occasionally happened in consequence of overdoses. It will also be found useful in adults, administered in the same manner, to check vomiting. In chronic constipation the following formulæ may be used :—

℞ Podophyllotoxini,
Aloini,
Extracti belladonnæ folior. alc.,
Extracti ignatiæ, . . . . . . . . . āā gr. ij.
Extracti taraxaci, . . . . . . . . . . gr. xl.
M. et ft. pil. no. xx.
Sig.: A pill three times a day.

Bouchut* recommends in infantile constipation this syrup :

℞ Resinæ podophylli, . . . . . . . . gr. $\frac{3}{4}$.
Alcoholis, . . . . . . . . . . . gr. lxxv.
Syr. althææ, . . . . . . . . . . . f℥iij.
M. Sig.: A dessertspoonful daily.

It is also useful in malarial liver disorders and jaundice, and in dyspepsia dependent upon deficient secretion of the liver and intestinal glands. In that form of sick headache associated with loose and dark-colored stools, podophyllum generally affords relief.

**POLYGONATI RADIX.—Root of Solomon's Seal.**

**Dose**, gr. xv–xxx, in fluid extract.

**Pharmacology.**—The Polygonatum giganteum and P. biflorum (Liliaceæ), common plants in the Eastern United States, have peculiar, boot-shaped rhizomes, bearing the scars of preceding leaf and flower-stalks, which look like the impress of a seal. They contain a bitter, acrid principle, **Convallarin,** with other vegetable constituents, such as tannin, mucilage, etc.

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* *L' Union Médicale*, August 5, 1890, p. 180.

**Physiological Action.**—Slightly tonic, astringent, and alterative.

**Therapy.**—Used externally, in decoction or fluid extract, as an application to freckles, and for relieving bruises, sprains, and local inflammation; also as an injection for leucorrhœa, menorrhagia, and as a wash for hæmorrhoids. Internally, it has been used in rheumatism, gout, and dropsy. It is claimed to have special effects upon relaxed mucous membranes.

**POLYGONUM.—Water-Pepper, Smart-Weed.**

**Dose,** ♏x–ʒj, in fluid extract.

**Pharmacology.**—The smart-weed, Polygonum hydropiperoides (Polygonaceæ), is a small, indigenous herb, with narrow, green leaves and spikes of small, greenish or white flowers. It contains **Polygonic acid,** an acrid principle insoluble in water, with tannin, etc. The active principle is dissipated by heat, and therefore an alcoholic tincture of the fresh plant is the best form, or a well-made fluid extract. The dose of the fluid extract is from ♏x to fʒj. A solid extract has also been prepared, the dose of which is from 1 to 5 grains.

**Physiological Action.**—Polygonum has a burning, acrid taste; inflames the skin when rubbed upon it, and internally has stimulating effects, especially to the ovarian functions and to the kidneys. Polygonum increases the number and strength of the cardiac contractions, promotes and increases the capillary circulation and causes warmth of the surface, accompanied by an increase of perspiration.

**Therapy.**—Employed in domestic practice, externally as counter-irritant and internally as an emmenagogue, ½-drachm doses of the fluid extract being administered for several days before the expected period, in amenorrhœa. Water-pepper is likewise of service in functional impotence. On account of its diuretic virtue it has been employed for the purpose of washing out sand or gravel from the kidney or bladder. It has also been used in diarrhœa, bronchitis, and catarrhal disorders.

A poultice made with water or vinegar from the leaves of Polygonum persicaria has been found an excellent anodyne application by Professor Flagg. In dental practice he recommends the warm poultice as beneficial in facial neuralgia, while, applied cool, it relieves pathological conditions attending the eruption of the lower wisdom tooth.

**POLYTRICHIUM.—Haircap Moss.**

**Pharmacology.** — Polytrichium juniperinum (Musci) is a mossy plant, growing abundantly throughout North America, in marshy places. A fluid extract may be used in the dose of 1 to 2 fluid-drachms

**Physiological Action and Therapy.**—The taste of polytrichium is somewhat pungent, but not acrid. Dr. Eckfeldt states that it has a certain nauseant effect, is alterative, and a diuretic of considerable power. He declares that the use of the drug for a few days causes an appreciable loss of weight, and that its physiological action merits a closer investigation than it has yet received. Dr. Eckfeldt has employed polytrichium with advantage in dropsical conditions due to disease of the liver or kidneys. Its effects are increased by combination with a diuretic or hydragogue cathartic.

**POPULI CORTEX.—White Poplar-Bark, American Aspen.**

**Dose,** gr. xxx–ʒj, in fluid extract.

**Pharmacology and Therapy.**—The Populus tremuloides (Salicaceæ), a forest tree of the United States, contains in its bark **Populin,** a bitter principle, resembling quinine or cinchonine in its physiological and therapeutical effects. Poplar-bark has been used as a tonic and antiperiodic in doses of 30 to 75 grains several times a day in decoction or fluid extract. An extract may be obtained by evaporating the fluid extract to the pilular consistence. Dose, gr. ii–xij.

The terminal buds of the poplar have a balsamic odor, and contain volatile oil, resin, etc., and possess the medicinal properties of terebinthinate substances. The ointment of poplar-buds (made by digesting freshly-bruised poplar-buds with twice their weight of hot lard, and gently boiling until all moisture is dissipated) is a fragrant ointment resembling benzoinated lard in antiseptic qualities.

**POTASSIUM.**—The metal **Kalium.**

*Salts and Preparations.*

*Potassa* (U. S. P.).—Caustic Potash, Potassium Hydrate.

*Liquor Potassæ* (U. S. P.).—Solution of Potassa. *Dose,* ♏i–xx. Well diluted.

*Potassa cum Calce* (U. S. P.).—Vienna Paste (equal parts potassium hydrate and lime. Made into paste with alcohol). Escharotic.

*Potassi Acetas* (U. S. P.).—Potassium Acetate. *Dose,* gr. x–ʒj.

*Potassi Bichromas* (U. S. P.).—Potassium Bichromate. *Dose,* gr. $\frac{1}{5}$.

*Potassi Bitartras* (U. S. P.).—Potassium Bitartrate, Cream of Tartar. *Dose,* gr. xx–ʒiv.

*Antimonii et Potassii Tartras* (U. S. P.).—Tartar Emetic. *Dose,* gr. $\frac{1}{40}$–j.

*Ferri et Potassii Tartras* (U. S. P.).—Iron and Potassium Tartrate. *Dose,* gr. x–xxx.

*Potassii et Sodii Tartras* (U. S. P.).—Potassium and Sodium Tartrate, Rochelle Salt. *Dose,* gr. xx–ʒiv.

*Potassii Tartras.*—Potassium Tartrate. *Dose,* gr. v–xx.

*Potassii Bromidum* (U. S. P.).—Potassium Bromide. *Dose,* gr. x–ʒj.

*Potassii Carbonas* (U. S. P.).—Potassium Carbonate. *Dose,* gr. ii–xx.

*Potassii Bicarbonas* (U. S. P.).—Potassium Bicarbonate. *Dose,* gr. v–xxx.

*Potassa Sulphurata* (U. S. P.).—Sulphurated Potassa (sometimes called sulphuret or sulphide of potassium). *Dose,* gr. ii–viij.

*Potassii Sulphas* (U. S. P.).—Potassium Sulphate. *Dose,* gr. xx–ʒij.

*Potassii Sulphis.*—Potassium Sulphite. *Dose,* gr. v–ʒj.

*Potassii Chloras* (U. S. P.).—Potassium Chlorate. *Dose,* gr. ii–x.

*Trochisci Potassii Chloratis* (U. S. P.).—Troches of Potassium Chlorate. *Dose,* one or two troches.

*Potassii Citras* (U. S. P.).—Potassium Citrate. *Dose,* gr. x–xl.

*Potassii Citras Effervescens* (U. S. P.).—Effervescent Potassium Citrate. *Dose,* ʒss–ʒjss.

*Liquor Potassii Citratis* (U. S. P.).—Solution of Potassium Citrate.

(Effervescing draught is the extemporaneous solution of potassium citrate, made by mixing equal quantities of two solutions, one containing ℥ij of citric acid to the pint, the other ℥ii$\frac{2}{3}$ potassium bicarbonate to the pint. It contains about 9 per cent. of potassium citrate, with a little free citric and carbonic acids. *Dose,* f℥j or f℥ss of each of the solutions.)

*Mistura Potassii Citratis.*—Mixture of Potassium Citrate (made by neutralizing fresh lemon-juice with crystals of potassium bicarbonate. Must be freshly prepared). *Dose,* f℥ss.

*Potassii Cyanidum* (U. S. P.).—Potassium Cyanide. *Dose*, gr. $\frac{1}{12}$–j.

*Potassii Ferrocyanidum* (U. S. P.).—Potassium Ferrocyanide, or Yellow Prussiate of Potash. *Dose*, gr. x.

*Potassii Hypophosphis* (U. S. P.).—Potassium Hypophosphite. *Dose*, gr. ii–xxx.

*Syrupus Hypophosphitum* (U. S. P.).—Syrup of the Hypophosphites. *Dose*, f ʒ ss–ij.

*Potassii Iodidum* (U. S. P.).—Potassium Iodide. *Dose*, gr. v–ʒj.

*Unguentum Potassii Iodidi* (U. S. P.).—Ointment of Potassium Iodide (potass. iodide 12, sodium hyposulphite 1, water 10, benzonated lard 77 parts, or about ʒj to ℥j).

*Potassii Nitras* (U. S. P.).—Potassium Nitrate, Saltpetre. *Dose*, gr. ii–xx.

*Charta Potassii Nitratis* (U. S. P.).—Potassium Nitrate Paper (unsized papers moistened with a 20-per-cent. solution in water, and dried and cut into pieces about 8 inches square).

*Argenti Nitras Dilutus* (U. S. P.).—Diluted Lunar Caustic (contains potassium nitrate).

*Potassii Permanganas* (U. S. P.).—Potassium Permanganate. *Dose*, gr. ss–ij.

*Liquor Potassii Arsenitis* (U. S. P.).—Solution of Potassium Arsenite. Fowler's Solution (strength nearly 1 per cent.). *Dose*, ♏i–x.

*Pulvis Effervescens Compositus* (U. S. P.).—Seidlitz Powder (sodium bicarbonate and Rochelle salt, in a paper together; tartaric acid in a separate paper. Dissolve separately in water and mix). *Dose*, 1 or 2 taken while effervescing.

**Pharmacology.**—Potassium salts exist in certain minerals, but they are derived principally from the ashes of plants; they are also present in animal tissues, especially in the muscles. Potassium is a white metal discovered by Humphry Davy in 1807. It decomposes water with such violence that it ignites the hydrogen, burning with a red flame and forming the hydrate or caustic potash, which is a most powerful alkaline base, soluble in half its weight of water. When dissolved in 20 parts of water it forms liquor potassæ. Potassium chlorate, when triturated in a mortar with sugar, sulphur, tannin, charcoal, glycerin, and numerous other substances, and occasionally even triturated alone, is liable to explode; and therefore, in making the troches, the Pharmacopœia directs that the chlorate shall be added to the other ingredients last and mixed carefully by means of a horn spatula. The troches sometimes explode spontaneously. At all events, the proportion is too large; there should not be more than 1 or 2 grains in each lozenge. The bichromate also forms an explosive mixture with glycerin. The salts of potassium are usually colorless or white and are generally soluble in water; some of them are deliquescent.

**Physiological Action.**—Caustic potash abstracts water and fat from ths tissues and produces a soft eschar when applied to the skin, which is subsequently separated by inflammation from the uninjured parts. This substance, moreover, dissolves the albuminous constituents of parts with which it is brought into contact. Taken internally in concentrated form, it is a corrosive mineral poison, destroying the soft parts and causing much irritation and secondary inflammation of the larynx or œsophagus, leading to stricture and gastritis. Even by liquor potassæ these symptoms may be produced, unless the remedy be very largely diluted. The carbonate is a powerful antacid, both in the intestinal tract and in the blood, favoring the expulsion of uric acid, with which it forms salts more soluble than those of sodium; the bicarbonate, however, is preferable for internal administration, being more acceptable to the stomach. Under its use the urine becomes alkaline. Potassium is a cardiac poison, a muscle and nerve paralyzer through an influence upon protoplasm, and destructive to the ozonizing function of red blood-corpuscle. These effects are shown to a different degree by different salts, and vary with the dose. In physiological doses they increase the secretions, stimulate retrograde metamorphosis, and promote oxidation; if too long continued, they produce anæmia and wasting of the body. Small doses of the bicarbonate, taken before meals, stimulate the secretion of gastric juice and make the urine more acid; larger doses disorder digestion, are partly decomposed by the gastric juice, which is made less acid, and partly enter the blood, increasing its alkalinity and the alkalinity of the urine also. In rare instances potassium bicarbonate has occasioned a vesicular eruption similar to that of eczema. The potassium salts with vegetable acids are generally decomposed in the blood, the vegetable acid being destroyed, the base combining with carbonic acid and escaping in the urine, which it renders alkaline. The salts with mineral acids are not decomposed, but in passing through the body exercise more or less effect upon the blood and certain organs. The nitrate, in large doses, exerts a paralyzing influence upon the spinal cord, and produces great muscular weakness and reduction of reflex sensibility. In moderate doses, the nitrate raises arterial tension and slows the heart's action, but larger doses weaken its movements and finally arrest them. The fibrin of the blood is less coagulable and the red blood-corpuscles have their oxygen-carrying powers reduced. The urine is increased in quantity. Death has sometimes been caused by the nitrate in consequence of its irritant effect upon the gastro-intestinal mucous membrane. According to the experiments of Aubert and Dehn most of the potassium salts, with the exception of the permanganate have the same effect as the nitrate upon the circulation.

Potassium chlorate acts like the nitrate upon the spinal cord, but has a more profound action upon the blood, disintegrating the corpuscles and making it of a chocolate color. Taken in large doses, vomiting, with hæmatemesis, delirum, hæmatogenous jaundice, and coma result. The bodily temperature is markedly depressed by large doses of the salts of potassium, and especially by the nitrate and chlorate.

Landerer* reports a case of a man 18 years of age, who, for tonsillitis, had been given 460 grains of potassium chlorate, to be dissolved in water and used as a gargle. He dissolved the whole in hot water and drank it in two portions within half an hour, in the evening. He subsequently was faint and extremely thirsty, and drank some beer, which produced violent vomiting through the night and pain in both hypochondria. Next morning he came to the hospital, with headache, faintness and constipation. His skin was anæmic, eyes and lips cyanotic; he had rigors and slight jaundice. The liver was slightly enlarged; there was pain over the stomach and kidneys. The urine was very small in quantity, only about a drachm; very albuminous, and deposited a brown sediment of altered blood-corpuscles. On filtration, the color was dark-cherry red. It gave the guaiac reaction and, on spectroscopic examination, the lines of methæmoglobin. Blood from the finger also showed altered blood-disks in masses, as well as unaltered blood-corpuscles, which formed imperfect *rouleaux.* Death occurred six days later, without convulsions or special anæmic symptoms. During this time suppression of urine continued. The lesions, post-mortem, were distributed through the body, but chiefly seen in the intestinal tract (which was hyperæmic, inflamed, and eroded in places) and in the kidneys (which were much enlarged, œdematous, capsule adherent, blood-vessels overfilled, the tubes plugged with brownish masses, to which some detached epithelial cells adhered). The liver and spleen were also enlarged. The symptoms appear to be primarily dependent upon excessive blood destruction, blocking up the urinary tubules with the detritus, and the consequent nephritis and anæmia. Jaundice and cyanosis were due to the same cause. As a rational treatment, Landerer advises blood-letting, followed by transfusion. The preceding case is presented here as a typical illustration of the effects of potassium chlorate when taken in a poisonous dose. In many cases, death occurs earlier from collapse; in others the patient becomes cyanosed and prostrated, but slowly recovers after stopping the medicine and using antidotes. It was formerly thought that the chlorate, which contains a large proportion of oxygen, was capable of yielding some of it to the tissues, but this is not now believed possible, as the salt is excreted unchanged very largely by means of the salivary glands. In giving potassium chlorate its effects should always be closely observed and if drowsiness and scantiness or suppression of urine supervene the remedy should be at once discontinued. One of the rare effects of ingestion of potassium chlorate is the occurrence of an erythematous, vesicular or papular eruption.

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* *British Medical Journal*, December 13, 1890.

The nitrate, likewise, passes through the body unchanged. The treatment of poisoning will be considered in the next paragraph. The sulphate is a powerful purgative, but is too irritant to be used for this purpose, and less pleasant than Rochelle salt. The bitartrate, or cream of tartar, as it was formerly called, is diuretic as well as laxative. It is an ingredient in the compound jalap-powder, which is a very safe and efficient cathartic in dropsy attending heart or kidney disease. The salts of potassium are eliminated principally by the kidneys, though the salivary, mammary, and sudoriparous glands also assist in their removal. A portion is also believed to escape by the bowels, as the nitrate has been detected by Dr. Kramer in the fæces of animals to which it was administered.

**Treatment of Poisoning by Potassium Salts.**—Poisoning by potassium cyanide is not very frequent, but it occasionally occurs, the symptoms and treatment being those of hydrocyanic-acid poisoning. Alkalies should be promptly administered to prevent decomposition of the salt by the acid gastric juice, and the stomach and intestinal canal emptied as soon as possible, followed by the administration of arterial stimulants, such as coffee and ammonia, with cold affusions to the spine and friction of extremities. Doses of 3 to 5 grains have proved fatal.

Potassium ferrocyanide is decomposed even by weak acids with the liberation of hydrocyanic acid. Acids should, therefore, not be taken after the ingestion of the salt. Cases are on record in which death has been caused by this mistake.

When caustic potash has been swallowed, it is necessary to use demulcents freely, with vinegar as a chemical antidote, and encourage vomiting, giving digitalis and stimulants hypodermically to sustain the heart. After death there is found inflammation, with softening, erosion, and sometimes perforation of the stomach. Death may ensue from shock, cardiac paralysis, or inflammation of the stomach and intestines. Potassium chlorate causes death by depression of vital powers, due to its destructive action upon the blood and the congestive obstruction of the kidneys. The treatment is by saline purgatives and diuretics, especially calomel and caffeine, with hot baths, and, in case there is much cyanosis, transfusion of blood. Potassium bromide causes gastralgia occasionally when taken into an empty stomach; this is relieved by hot drinks and carminatives.

**Therapy.**—Although an efficient escharotic, caustic potash is not often used because it produces a burn that is attended by a good deal of inflammation and pain. It was formerly the custom, in the treatment of diseases of internal organs, to establish an issue by application of caustic potash, and the resulting ulcer was kept irritated by a dried pea or a small piece of orris-root; but this practice is rarely resorted to at present. On account of the powerful, extensive, and penetrating action of this substance, it should never be used without precautionary measures being taken for the purpose of limiting its effects. A hole cut in a piece of adhesive plaster, or in several pieces overlying each other, then placed upon the skin, is a simple device by which the application of the caustic may be circumscribed. Nor should it be left long in contact with the integument, since its influence continues for some hours after it has been removed. When the integument acquires a bluish tinge, and the epiderm is softened, it is time that the remedy should be discontinued. The spot should then be washed with some weakened vinegar, in order to neutralize any alkali which might remain. Finally, a poultice is applied to the area of action. Surgeons use caustic potash in treating fistula in and after operation, in order to prevent immediate union; also to soften ingrowing toe-nail. Dr. Pürckhauer, of Bamberg,* describes a method which he has used with entire success in the treatment of this painful affection. The portion of nail which needs to be removed is painted with a 40-per-cent. solution of caustic potash. At the end of a few seconds the upper layer of the nail has become so soft that it can be easily scraped off with a sharp-edged piece of glass. The procedure is repeated until all that remains of that portion of the nail is a thin scale, which can be excised by means of a pair of fine scissors. A valuable advantage of this practice is, that the patient is able to follow his usual avocation without the loss of any time.

It is likewise used as an application to enlarged tonsils. Caustic potash is sometimes employed for the destruction of carcinomatous growths, the limitation of sloughing ulcers, or the removal of the hard, callous edges of chronic ulcers. Caustic potash has also been employed for the purpose of destroying warts, nævi and malignant pustules. It was formerly applied, not infrequently, to the surface of chancres, chancroids, and syphilitic ulcers, but is far too severe for such a purpose.

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* See *Medical Bulletin*, March, 1891.

In phagedæna, however, it may be advantageously employed; but in most cases the Vienna paste will be found a desirable substitute. The solution of potassium permanganate (gr. v–xl in fʒj) was formerly known as Condy's fluid; it is an oxidizing disinfectant, and a useful agent in dilute solution for irrigating wounds or ulcers. A solution of this substance is a serviceable application to the throat in diphtheria and scarlet fever. Potassium permanganate is recommended by Weir Mitchell as the best antidote to the venom of snake-bite, provided that it can be brought into direct contact with the virus before absorption, and has lately been brought forward by Dr. William Moor as an antidote to opium.

The permanganate, and caustic potash as well, have been employed with a view to neutralizing or destroying the poison of rabid animals, though the results have not been encouraging. A solution of the permanganate is an efficient deodorizer in ozæna and inflammation of the middle ear. Potassium bicarbonate is a good lotion (ʒj–Oj) for eczema and rheumatic joints, and in stronger solution (ʒij–Oj) as an application in pruritus vulvæ, and to bites of animals or insect-stings.

In cases of pruritus Dr. E. B. Bronson, of New York, often employs a lotion composed of:—

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| ℞ Acid. carbolic., | ʒj–ij. |
| Liq. potass., | f℥j. |
| Ol. lini, | f℥j. |

M. Sig.: Shake before using. A drop or two of bergamot oil may be added in order to overcome the odor of the linseed oil.

In eczema of the vulva Lusch recommends the following formula:—

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| ℞ Potass. bicarb., | ʒj. |
| Sodii bicarb., | ʒij. |
| Glycerin., | fʒjss. |
| Tr. opii, | f℥ij. |
| Aquæ, | f℥viij. |

M. Sig.: For use, night and mornings, as a lotion.

Leucorrhœa, dependent upon the excessive functional activity of the glands of the cervix uteri, is markedly benefited by vaginal injections of weak solutions of potassium bicarbonate. The same solution has been used, with asserted success, injected into the bladder as a solvent of uric-acid calculi. A drachm of potassium cyanide dissolved in a pint of water will often allay paræsthesia. The same solution may be applied to the head for the relief of reflex ache.

The chlorate is also employed as a detergent wash, especially in the mouth and throat (℥j–Oj), and in mercurial salivation it is particularly useful. In weaker solutions it may be applied to unhealthy wounds, or injected into sinuses and into the bladder or rectum for local inflammation. Hæmorrhoids are often, according to H. C. Wood, relieved by the injection into the rectum of a saturated solution of potassium chlorate combined with a few drops of laudanum. According to Unna, finely powdered potassium chlorate is the best antiseptic dentifrice. The mouth should be thoroughly cleansed after its use.

Dillon's dentifrice is thus composed:—

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| ℞ Pulv. potass. chlorat., | | ℥j. |
| Pulv. salol., | | |
| Pulv. cretæ, | | |
| Pulv. carbon. lign., | | |
| Pulv. cinchon., | āā | ʒiiss. |

M.

The powder is likewise advantageously dusted upon aphthous spots. In the form of powder it is dusted over exuberant granulations and malignant ulceration, and acts as an antiseptic and astringent. Prof. P. D. Keyser has had much success in treating small epitheliomata of the eyelids by the daily application of finely-powdered potassium chlorate, and has thus saved a resort to the use of the knife in some cases. As troches, potassium chlorate is dissolved slowly in the mouth, so as to constantly moisten the throat; and in this way it is very valuable in scarlatinal and diphtheritic sore throat.

Potassium bichromate, in solution, is a good application to warts and corns, and to venereal excrescences or mucous patches. It is largely used with sulphuric acid as a battery fluid, and accidents occur by swallowing some of the fluid; the symptoms of irritant corrosive poisoning at once appear, with vomiting, pain, and restlessness, requiring the use of demulcents and anodynes, and free evacuation of the stomach and bowels.

Internally, where alkalies are required, the salts of potassium have been very largely used. In acid dyspepsia, the bicarbonate, in large doses after meals, neutralizes the excess of acid and relieves heartburn and pyrosis; while small doses, before meals, in atonic dyspepsia, stimulate the free secretion of an acid gastric juice. In some cases of gastralgia the pain may be relieved by the bicarbonate in some effervescent water. The same salt is of value in the indigestion of obese individuals, also of rheumatic and gouty subjects. It is of material assistance, moreover, in the digestion of fatty food.

In dyspepsia accompanied by hyperacidity, with pain or vertigo, Robin prescribes:—

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| ℞ Potass. bitartr., | ʒiij. |
| Sulphur. subl., | ʒj¼. |
| Cret. ppt., | ʒss. |
| Pulv. ipecac. et opii, | gr. xv. |

M. et div. in chart. no. x.
Sig.: One powder after each meal.

In diarrhœa, excited by an excessive quantity of acid in the bowel, potassium bicarbonate is an efficacious remedy. The carbonate, in doses of a grain or two several times a day, is a remedy of some utility in whooping-cough. In some forms of bronchitis, especially in gouty persons, the liquor potassæ is a good addition to a cough mixture, to liquefy the mucus and facilitate expectoration:—

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|---|---|---|
| ℞ Liquoris potassæ, | | f℥j. |
| Syr. senegæ, | | f℥j. |
| Mist. glycyrrhizæ co., | q. s. ad | f℥vj. |

M. Sig.: Take a dessertspoonful in a wineglassful of water every three hours for bronchitis, with scanty and tough expectoration.

As the urine is rendered alkaline under its use, liquor potassæ is frequently combined with other remedies in treating gonorrhœa:—

℞ Liquoris potassæ,
Copaibæ, . . . . . . . . . . . āā fʒvj.
Mucilag. acaciæ, . . . . . . . . . . . f℥iij.
Spiritus ætheris nitrosi, . . . . . . . . . . fʒvj.
Tincturæ opii, . . . . . . . . . . . fʒj.
Aquæ, . . . . . . . . . . q. s. ad f℥vj.
M. Sig.: Take a tablespoonful well diluted, three or four times daily, in acute gonorrhœa.

In cystitis and pyelonephritis, the same combination can be used, in order to render the urine less irritating. If, however, in cystitis, alkaline decomposition has occurred, the administration of alkaline remedies will, as Ringer points out, aggravate the disorder by assisting the transformation of urea into ammonium carbonate. The alkaline treatment in acute rheumatism is suited to plethoric subjects, with strongly acid perspiration. The bicarbonate is used in doses of 20 to 30 grains every four or five hours in cinnamon-water, or the citrite or acetate may be given in full doses. If the system is alkalinized early in the disease, there is less danger of cardiac complication. Very often the treatment is best begun with potassium iodide for a day or two, and then the bicarbonate is substituted. The iodide is of special value in chronic rheumatism in 10-grain doses, with compound syrup of sarsaparilla and water, three times a day. The carbonate may be added to a warm bath for rheumatic cases with benefit, especially in diseases of the skin of rheumatic origin. Potassium acetate is the most diuretic of these salts, and is useful in œdema, ascites, and other effusions:—

℞ Potassii acetat., . . . . . . . . . . . ʒiv.
Infusi pilocarpi,
Spts. junip. co., . . . . . . . . . . āā f℥ij.
M. Sig.: A dessertspoonful in water, every two hours, in suppression of urine.

The salt may also be used with advantage in cases of functional inactivity of the liver. In lithæmia and disorders of the urinary secretion we obtain good results from the administration of the citrate or bitartrate:—

℞ Potassii bitartrat. (crystals), . . . . . . . . ℥ss.
Infus. juniperi, . . . . . . . . . . . Oj.
M. et ft. sol.
Sig.: To be drunk during the day to increase the flow of urine.

The diuretic properties of the bitartrate render it valuable in chronic Bright's disease. For the same reason this salt is of advantage in the treatment of puerperal eclampsia. Both the bitartrate and acetate are of avail in œdema dependent upon disease of the heart. The deposition of uric acid and formation of stone in the bladder may be prevented by the persistent administration of an alkali, and it is probable that small calculi may thus be dissolved within the bladder. Continued alkalinity of the urine is best maintained by means of the citrate, as that salt is less apt to derange the functions of the stomach or exert a deleterious influence upon the blood-corpuscles.

℞ Potassii citrat.,
Lithii citrat., . . . . . . . . . . . āā ʒij.
Div. in chartulas no. xxiv.
Sig.: Take one in a glass of Vichy water, every four hours, in lithæmia.

In hæmorrhoids the following is a useful laxative:—

| | |
|---|---|
| ℞ Potassii bitartrat., | ℥j. |
| Sulphuris loti, | ʒss. |
| Pulv. aromat., | ʒss. |

M. Sig.: A teaspoonful once or twice daily, made into a bolus with orange-syrup.

Sir William Gull esteemed potassium bitartrate as "of singular value in alcoholic cirrhosis." Good results have also been obtained from its use in the same affection when dependent upon other causes and in chronic peritonitis.

Potassium citrate is of service in the first stage of acute bronchitis, and in the form of neutral mixture or effervescing draught it affords marked relief to the nausea and vomiting which accompany febrile affections. It is, likewise, well adapted to the irritable stomach of phthisis. Incontinence, from a too concentrated condition of the urine, is benefited by administration of the citrate. The potassium and sodium tartrate is a very useful saline laxative, and is serviceable in fevers. The Seidlitz powders are most efficient taken early in the morning, when the stomach is empty. Potassium sulphate is not used as a purgative, although it has some cholagogue power; its action is too severe, and it is very bitter. Being a hard and dry powder, the sulphate is utilized in pharmacy for the trituration of powders and pill-masses. Potassium nitrate in small doses reduces temperature and the force and frequency of the heart's action, and is useful in the treatment of pneumonia, as in the following combination:—

| | |
|---|---|
| ℞ Potassii nitrat., | gr. iij. |
| Pulv. ipecac. et opii, | gr. i–ij. |

M. et ft. chartulæ mitte tales no. xij.
Sig.: Take one every two or three hours.

Potassium nitrate is also used in acute rheumatism. Unsized paper, saturated in a solution of nitre, is burned, and its fumes inhaled with good results in asthma. According to M. Corson, 2 grains of potassium nitrate in a glass of sugar and water will relieve the hoarseness to which speakers and singers are liable. Dr. Peter Buro, of Arva-Polhora, asserts, as a result of clinical experience, that potassium nitrate is a specific remedy in typical malarial intermittent, of whatever form. He administers it to adults in single doses of 15 to 24 grains in either the febrile or non-febrile stage, and states that it gives rise to no disturbance of the digestive organs or nervous system. This salt is sometimes of value in the treatment of hæmorrhage. In hæmoptysis accompanied by febrile excitement it has been prescribed with advantage. In purpura simplex 10-grain doses, and in purpura hæmorrhagica from 10 to 60-grain doses have been reported as successful. Potassium nitrite is still more depressing to the circulation, resembling nitro-glycerin,—indeed, practically identical in action,—according to Atkinson.* It may be substituted for the latter in the treatment of neuralgic heart affections (angina pectoris) and in epilepsy, in doses of gr. iii–v. Larger doses are dangerous. In asthma, it also may be given in conjunction with inhalation of nitre-paper fumes. Potassium cyanide is used as a means of introducing hydrocyanic acid into the system for the relief of the cough of bronchitis and phthisis. The permanganate has been given internally, it is said, with good results in flatulent dyspepsia and lithæmia. This salt, however, soon disagrees with the stomach. Neusser has recently reported favorably upon the action of potassium tellurate in the night-sweats of phthisis. He has found that this substance, in many cases, either suppresses or considerably diminishes the sweats. Pills containing 2 centigrammes (⅓ grain) were given at first, but, in some instances, it was necessary to double the dose after they had been in use for about a week. No toxic symptoms were ever manifested; the appetite sometimes seemed to be improved by the drug. It communicates a strong odor, resembling garlic, to the breath of the patient. The therapeutic action of potassium bromide is discussed under Bromine.

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* *Journal of Anatomy and Physiology*, January, 1888; paper on the "Pharmacology of the Nitrites and of Nitro-Glycerin," read before Section on Therapeutics and Materia Medica. Ninth International Medical Congress, Washington, D. C., September, 1887.

**Potassium Chlorate** is extravagantly praised by some and neglected almost entirely by others. It has been shown that, administered in 15-grain doses three times a day, it is serviceable in preventing disease of the placenta, and thus enabling a woman to go on to the end of term who had previously had several miscarriages. It appears, then, to be valuable in preventing intra-uterine death of the fœtus, if administered for four or five months in the above doses. In maternal stomatitis it is regarded by some authorities as the only remedy worth mentioning, in doses of gr. xv–xx, three times a day. In the sore mouth of mercurial salivation it should be given internally and used locally as a wash, and also in the membranous and ulcerative sore mouth of children. From a review of its action it appears that persons are not equally susceptible to its effects, since one can take, with very little evident effect, a dose which would produce very decided symptoms in another. Hence arises a necessity for commencing with small doses, and gradually increasing to the quantity required to produce the effect. Dr. J. G. Sinclair Coghill, of Ventnor, Isle of Wight, England, contributed to the Proceedings of the International Medical Congress, at Washington, a paper on the subject, which very fairly and ably sums up the value of the drug. He found it useful in cases of deficient oxygenation of the blood, especially in placental inadequacy (as above stated); also in pulmonary insufficiency, arising from many pathological conditions interfering with the function of the lungs. He finds it a cardiac stimulant in debility of the heart, whether organic or functional, probably by improving the quality of the blood; where the blood is impoverished, as after hæmorrhages, in anæmia, chlorosis, malerial cachexia, and in convalescence after acute diseases. In chlorosis, he gives the tincture of ferric chloride in an effervescing solution containing 25 grains of potassium chlorate, thrice daily after meals. Quinine, digitalis, and nux vomica may also be used. It is best given in aërated water after food. It has decided antiseptic effects, and these are well shown when there is suppuration along the genito-urinary tract. In typhoid fever, when the skin is dry and the lips parched, Dr. R. B. Norment, of Baltimore, prescribes:—

℞ Potass. chlorat., . . . . . . . . . ʒss.
Sp. æther. nitrosi,
Liq. ammon. acetat., . . . . . . q. s. ad f℥iij.
M. Sig.: A dessertspoonful every three or four hours.

In combination with arsenic (Fowler's solution) internally and chlorate lozenges (āā gr. iiss) locally, it is of singular efficacy in clergyman's sore throat or follicular pharyngitis. Dr. A. Harkin regards this salt as an efficient galactagogue, having successfully used it for this purpose during many years.

In diphtheritic croup Dr. Drysdale recommends:—

| | |
|---|---|
| ℞ Potassii chloratis, | ʒij. |
| Syrupi limonis, | f℥j. |
| Aquæ, | f℥iij. |

M. Sig.: Dose to a child under 2 years a teaspoonful, from 2 to 10 two teaspoonfuls, every half hour in urgent cases.

In diphtheria, it should not be used in full doses on account of the depressing action of the potash upon the heart. Waugh uses:—

| | |
|---|---|
| ℞ Potassii chloratis (pulv.), | ʒj. |
| Acidi hydrochlorici, | fʒiss. |
| Misce et adde | |
| Tr. ferri chloridi, | fʒij. |
| Aquæ, q. s. ad | f℥iv. |

M. Sig.: A teaspoonful to be given undiluted every two hours.

Free chlorine is generated in this mixture, which is based on Watson's celebrated formula. It has been very successful in Waugh's hands, succeeding in one case where sublimate applications (1 to 500) failed to check the spread of the disease. When diluted with water the above formula makes an excellent gargle. In the sore throat of phthisical patients we may give:—

| | |
|---|---|
| ℞ Potassii chloratis, | gr. xl. |
| Glycerini, | f℥ss. |
| Morphinæ hydrochlorat., | gr. iss. |
| Syrup. aurantii, q. s. ad | f℥iv. |

M. Sig.: A teaspoonful occasionally.

Potassium chlorate will often be found beneficial in chronic bronchitis, and may be serviceably combined with ipecacuanha and senega. In hæmaturia, purpura, scrofula, and many chronic affections, the chlorate has been used in some cases with marked results. In many affections of the skin, especially those attended with suppuration, the author can speak with unqualified approval of the action of the chlorate. In sycosis, pustular acne, eczema pustulosum, furuncles and carbuncles, the suppurative stage is decidedly abridged. It exerts a tonic influence in scrofula, and is peculiarly appropriate in the case of debilitated subjects of syphilis. Potassium chlorate, as a rule, should be prescribed alone and not in combination with other agents, which may decompose it. Potassium iodide has been already discussed under Iodine.

As an alterative tonic, Professor J. MacFadden Gaston recommends:—

| | |
|---|---|
| ℞ Potass. chlorat., | ʒij. |
| Tr. nucis vom., | fʒij. |
| Tr. cinchon. co., | f℥iv. |
| Aquæ, q. s. ad | f℥viij. |

M. Sig.: Tablespoonful every three hours.

In nervous dyspepsia Dr. J. P. Crozer Griffith often prescribes, with advantage, potassium cyanide combined with extract of valerian, to be taken after each meal.

**Potassium dithiocarbonate.**—This compound is obtained by the action of carbon disulphide on potash lye at the boiling temperature. It occurs in the form of a crystalline powder, deliquescent, of an orange-red color, very soluble in water and but slightly soluble in alcohol. Made into an ointment of 5, 10 or 20 per cent. strength, it has been used, with reported good results, in various diseases of the skin. The stronger preparations may prove irritant.

### PRINOS.—Prinos, Black Alder.

**Dose,** ʒss.

**Pharmacology.**—The black alder, Prinos verticillatus (Aquifoliaceæ), or winter berry, is an indigenous shrub, or small tree, bearing clusters of bright-red berries. The bark, which was formerly official, contains resin, tannin, and some bitter principle not yet isolated.

**Physiological Action.**—It is astringent, tonic and alterative.

**Therapy.**—Prinos is administered in the form of fluid extract, or a decoction, in gastric disorder and diarrhœa. Antiperiodic virtues have been attributed to this drug. It is also used internally and as an application in skin diseases and as a topical application to indolent and unhealthy ulcers.

### PRUNUM (U. S. P.).—Prune.

**Pharmacology.**—The prunus domestica (Rosaceæ), or prune-tree, is cultivated as an article of food in all temperate climates. The dried fruit is official. The French prunes are the best; they should be large, sound, and not too dry. As stewed fruit they are used as a relish upon the table, and are generally liked. The cooked fruit is laxative, and is given to women after confinement, and to children. They may be made cathartic by the addition of senna or podophyllin, forming " medicated prunes."

### PRUNUS VIRGINIANA (U. S. P.).—Wild Cherry.

*Preparations.*

*Extractum Pruni Virginianæ Fluidum* (U. S. P.).—Fluid Extract of Wild Cherry. *Dose*, ♏x–fʒj.

*Infusum Pruni Virginianæ* (U. S. P.).—Infusion of Wild Cherry (4 per cent.). *Dose*, f℥i–iv.

*Syrupus Pruni Virginianæ* (U. S. P.).—Syrup of Wild Cherry (made by percolation, without heat). *Dose*, fʒi–iv.

**Pharmacology.**—The bark of the Prunus serotina (Rosaceæ), collected in autumn, has an aromatic, astringent, bitterish taste, and on maceration in water has the characteristic odor of hydrocyanic acid. This is developed by the presence of water, as the bark contains amygdalin and emulsin, which form hydrocyanic acid and an oil like the oil of bitter almond. Amygdalin is a crystallizable glucoside, bitter to the taste, soluble in water and alcohol, but insoluble in ether. Emulsin is an albuminous substance, which dissolves in water, and is coagulated by heat, acids and alcohol. Glycerin aids in keeping the dissolved matters in permanent solution, and is therefore added to both the fluid extract and the syrup. The former more fully represents the drug than the latter, since the tannin is soluble in the dilute alcohol, but not in water. The infusion and syrup, therefore, are less astringent than the fluid extract. A wine of wild cherry may be made by extracting the medicinal principles from the bark, or by the addition of 2 ounces of the fluid extract of wild cherry to 8 ounces of sherry wine. Dose, fʒi–f℥j.

**Physiological Action.**—Wild cherry is astringent, tonic, and sedative. Its pleasant flavor has made the syrup a popular vehicle for cough remedies. It increases appetite and promotes digestion, reduces expectoration and cough, and diminishes nervous irritability.

**Therapy.**—As a tonic, the infusion is very serviceable in phthisis, where it also lessens the cough and expectoration, strengthens the digestive organs, and reduces fever. In the cough of phthisis we get good results from the following combination :—

℞ Codeinæ, . . . . . . . . . . . . gr. ij.
Tr. belladonnæ, . . . . . . . . . fʒ ij.
Syr. pruni Virg., . . . . . . . q. s. ad f℥ iij.
M. Sig.: A teaspoonful, or two, when cough is troublesome at night.

Wild cherry allays nervous or reflex cough, and may very appropriately serve as a vehicle for more potent remedies in whooping-cough. Palpitation of the heart, whether purely nervous or of dyspeptic origin, is benefited by the administration of this drug. Cases have been reported by Dr. Clifford Allbutt in which wild cherry was of service in mitral insufficiency, and in dilatation of the heart with chronic bronchitis and dyspnœa. In nervous debility, insomnia, and poor digestion, small doses of the fluid extract are useful as a stomachic, taken before meals. In such cases, also, a ferrated wine of wild cherry, containing ferric phosphate (gr. ij in each fʒj) and fluid extract wild cherry, 10 per cent., will be found a good general tonic in doses of a drachm or two several times a day.

**PTELEA CORTEX.—Ptelea Bark, Hop-tree Bark.**

**Pharmacology.**—The Ptelea trifoliata (Rutaceæ), a tree of North America, affords, in the bark of the root, an appetizing tonic, occasionally useful during convalescence in dyspepsia, etc. It is best given in fluid extract; dose, ♏viii–xxx.*

**PULSATILLA** (U. S. P.).—**Pulsatilla, Meadow Anemone.**

**Dose,** gr. i–v, in fluid extract or tincture.

**Pharmacology and Therapy.**—The herb of Anemone pulsatilla and Anemone pratensis (Ranunculaceæ), collected soon after flowering. It should be carefully preserved and not kept longer than one year. Pulsatilla contains an acrid, fluid, volatile principle, which readily breaks up into **Anemonin** and **Pnemonic acid**. The active principle being volatile, the herb must be fresh or, at least, not kept longer than a year, if carefully preserved.

Anemonin occurs as white needles, slightly soluble in water and ether, readily soluble in hot alcohol and hydrochloric acid. Anemonin has been given in doses from $\frac{1}{10}$ grain to 2 grains.

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* Oldberg and Wall's Companion to the United States Pharmacopœia, second edition.

**Physiological Action.**—The recent plant has some irritant properties, the juice causing numbness, tingling, and inflammation of the part to which it is applied. Internally, it lowers the pulse-rate and temperature in the inferior animals, and stupor and convulsions have been produced by large doses. In considerable quantity in the human subject it causes nausea and vomiting.

**Therapy.**—Pulsatilla is reported to be adapted to the treatment of acute catarrh of the respiratory passages unattended by gastro-intestinal disorder. Borchain praises its action in acute epididymitis, given in doses of 1 or 2 minims of the tincture every two hours. Shapter has found it useful in hysterical convulsions and reflex spasms due to uterine disease. Phillips states that he has seen pulsatilla do good in mental disorders, and in sudden suppression of the menses, or lochia. Anemonin is said to be of avail in pertussis and irritative coughs. According to Dr. Bovet, it has a decided sedative action in dysmenorrhœa and other painful affections of the female pelvic organs. Anemonin was, in these cases, administered in doses of $\frac{1}{12}$ grain. Anemonin has been likewise used with alleged success in asthma and epididymitis.

## PYRETHRUM (U. S. P.).—Pellitory.

### *Preparation.*

*Tinctura Pyrethri* (U. S. P.).—Tincture of Pellitory (20 per cent.). Not used internally.

**Pharmacology and Physiological Action.**—The root of Anacyclus pyrethrum (Compositæ), a small plant of Africa, cultivated in Europe, contains an alkaloid, **Pyrethrine,** an acrid resin, a volatile oil, tannic acid, starch, mucilage, etc. Pyrethrum has an acrid taste, and causes a free flow of saliva (sialagogue), with a prickling, pungent effect upon the tongue when chewed. If swallowed in considerable doses, it causes diarrhœa and tenesmus and dysenteric or bloody stools, with depression and stupor. A child 3½ years old nearly died with gastro-enteritis after swallowing 50 minims of the tincture. It is irritating to the skin and causes sneezing when inhaled into the nostrils.

**Therapy.**—In neuralgic, rheumatic, and other painful affections of the tongue or teeth, pellitory may be chewed or held in the mouth. Pellitory-root is sometimes used as a masticatory in paralysis of the tongue, and may be employed in order to stimulate the salivary glands when their secretion is deficient. Dr. Whitla finds that the sialogogue action of pellitory constitutes an excellent means for the removal of iodine from the system. A few drops of the tincture may be introduced into hollow, aching teeth; or, diluted with water, it may be used as a stimulating mouth-wash or gargle in scorbutus and sore throat, with relaxed mucous membrane.

**Pyrethrum roseum,** or Persian insect-powder, is a variety of pellitory growing in Asia, of which the flower-heads are very destructive to insect life. The powdered flowers are largely used to kill insects. If a small quantity is placed upon a plate and wet with alcohol and ignited, the fumes will kill or drive from the room small insects like flies or mosquitoes. It is also used in household economy, and in furniture to destroy chink-bugs, and also to remove fleas from dogs. Schagdenhauffen and Reeb* have discovered recently in these flowers an active principle, which they name **Pyrethrotoxic acid**. When hypodermically injected into animals, it causes at first excitement, soon followed by complete prostration and paralysis of lower extremities, and death by failure of respiration and circulation.

**PYRIDINUM.—Pyridine.** $(C_5H_5N.)$

**Dose,** fʒi–ij, for inhalation.

**Pharmacology.**—Pyridine is a clear, colorless, volatile liquid, with characteristic odor and pungent taste. Pyridine is soluble in water and alcohol and forms crystalline salts which are likewise soluble in those fluids. In aqueous solution it has a marked alkaline reaction. It boils at 116° C. (240.8° F.), and is miscible with water, oil, alcohol, ether, and benzine, forming clear solutions. It gives precipitates with solutions of most metals, but not with lead acetate and magnesium sulphate. Pyridine is the foundation of a group of compounds known as pyridine bases, formed in the dry distillation of bones and other nitrogenous compounds, and as a decomposition product of nicotine and some other alkaloids. It was discovered in 1846 by Anderson. Chapman and Smith have made it by synthesis, by dehydrating amyl nitrite with phosphoric anhydride.

**Physiological Action.**—Upon the healthy adult, inhalations of the vapors of pyridine mixed with air produce flushing of the face, with quickening of the pulse and of the respiration, the latter lasting only a few moments, the former from fifteen minutes to ten hours, depending upon the amount inhaled. Pyridine produces slight giddiness and sometimes headache. According to Cantani, pyridine exerts a markedly deleterious influence upon the medulla and particularly upon the respiratory and cardiac centres. It diminishes reflex irritability and causes a fall of blood-pressure. In large doses pyridine causes a fall of temperature, cyanosis, paralysis and death from respiratory failure. It occasions the formation of methæmoglobin in the blood.

In asthmatic patients the quickening of the respiration is not observed; on the contrary, the heart's action slowly falls to the normal, if it had been previously accelerated, without change in rhythm or force, while the respiration becomes slower, easier, and fuller, the dyspnœa disappearing. In most cases there is a desire to sleep without narcotism or interference with brain functions, the patient being easily wakened, as out of natural sleep. The odor of the drug is soon recognized in the urine, and it is expelled by the kidneys and in part by the lungs. Its elimination by the urine is remarkably rapid. Pyridine is also possessed of some antiseptic properties.

**Therapy.**—From the fact that tobacco-smoke, when inhaled, gives relief in asthma, German Sée was led to attribute the effect to pyridine; and from clinical experience, in a woman suffering with asthma and dyspnœa from heart disease, he was induced to advocate its further employment. One or two teaspoonfuls were poured upon a plate, and the fumes inhaled by the patient with her head directly over it. These inhalations were continued from twenty to thirty minutes, and were found to afford much relief, and frequently to abort or arrest the dyspnœic attack. In a number of other cases, including some both of pure asthma and of cardiac asthma, this treatment was resorted to with remarkably good results. Sée believed that pyridine is the most certain agent for bringing relief when iodine fails, and that it is superior to the hypodermic use of morphine, its action being more lasting and better borne by the system. Dr. Neff* also reported good results. Of twelve cases, three were of nervous asthma, with complete relief and no return of the attack; three cases of cardiac asthma were relieved; three of bronchial asthma had no return of attack; of two cases of dyspnœa in advanced phthisis one was slightly relieved, the other was not benefited; one case of asthma, as complication of gout, was cured. All unpleasant symptoms were confined to cases with long-standing emphysema, or valvular or degenerative heart disease, with small, irregular pulse. In advanced phthisis it should be used with care, and probably will fail. Pyridine has given relief in angina pectoris. Cerna writes that it has been given internally in doses of 2 or 3 minims and as an injection with 300 parts of water in gonorrhœa. A decided drawback to the use of this remedy is its extremely disagreeable odor.

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* *American Journal of Pharmacy*, September, 1890.

## PYROGALLOL (U. S. P.).—Pyrogallol.

**Pharmacology.**—Pyrogallol is a triatomic phenol obtained by the dry distillation of gallic acid. It occurs in the form of brilliant white crystals, of a bitter taste and free from odor. The crystals darken on exposure to light. Pyrogallol is soluble in water, alcohol and ether. Its watery solution, in contact with the air, absorbs oxygen and acquires a brown color. The fluid changes also from a neutral to an acid reaction. The alteration takes place more rapidly if a caustic alkali is present in the solution.

**Physiological Action and Therapy.**—When applied to the skin pyrogallol causes a brown discoloration. The incautious application of pyrogallol may cause inflammation of the skin and this may result in extensive ulceration and sloughing. It will also stain the hair and nails as well as linen apparel with which it comes in contact. If absorbed in sufficient quantity this substance excites vomiting, diarrhœa, disturbances of temperature, nervous manifestations and great prostration of muscular strength. Fatal cases have occurred from the free use of an ointment on large cutaneous lesions. The urine is black and contains hæmoglobin and the blood becomes of a blackish or chocolate color. In dogs poisoned by pyrogallol hepatic lesions were produced identical with those caused by phosphorus. The mineral acids act as antidotes. Pyrogallol possesses antiseptic properties.

This compound has been little used as an internal remedy, although it was strongly recommended by Dr. A. Vesey in 1-grain doses in the treatment of hæmoptysis and hæmatemesis. The drug was administered hourly until the hæmorrhage had ceased. Pyrogallol is employed as an external application in certain diseases of the skin. It has a good effect upon the patches of psoriasis, and may be applied as an ointment or dissolved either in flexible collodion or in alcohol with the addition of a little glycerin. Used in a similar manner, pyrogallol is serviceable in lupus, lepra and syphilitic lesions of the integument.

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* *New York Medical Journal*, March 13, 1886.

**Gallacetophenone.**—This substance, a derivative of pyrogallol, was discovered by von Necki. Gallacetophenone is obtained by heating together a mixture of 1 part of pyrogallol, $1\frac{1}{2}$ parts of acetic acid and $1\frac{1}{2}$ parts of zinc chloride. It is a pale yellow crystalline powder, soluble in hot water, alcohol, ether and glycerin. The addition of sodium acetate promotes its solubility in cold water. Gallacetophenone is possessed of antiseptic properties. It has been used in 10-per-cent. solution as a substitute for pyrogallol in the treatment of psoriasis.

**PYROXYLINUM** (U. S. P.).—**Pyroxylin, Soluble Gun-Cotton.**

Gun-cotton is white, dry, and entirely soluble in a mixture of alcohol and ether. It is inflammable and violently explosive. Used in making collodion.

**QUASSIA** (U. S. P.).—**Quassia.**

**Dose,** gr. x–xxx.

*Preparations.*

*Extractum Quassiæ* (U. S. P.).—Extract of Quassia. *Dose,* gr. i–v.

*Extractum Quassiæ Fluidum* (U. S. P.).—Fluid Extract of Quassia. *Dose,* ♏v–xx.

*Tinctura Quassiæ* (U. S. P.).—Tincture of Quassia (10 per cent.). *Dose,* ♏xx–fʒj.

*Infusum Quassiæ.*—Infusion of Quassia (ʒij–Oj). *Dose,* fʒi–ij.

**Pharmacology.**—Quassia is the wood of Picræna excelsa (Simarubeæ), a large tree of the West Indies, usually occurring in the form of small chips or raspings, nearly white, without odor, but very bitter. It is sometimes made into cups or vases, in which hot water is poured at night, to be drunk early in the morning, or through the day, as a bitter tonic. Quassia-wood contains a bitter, neutral principle, **Quassin,** crystallizing in needles, and readily soluble in alcohol and in hot water. It also has a minute quantity of **volatile oil,** but **no tannin.** The solid extract is aqueous, but the fluid extract is made with dilute alcohol. The tincture is 50 per cent. stronger than the same preparation in the preceding revision of the pharmacopœia.

**Physiological Action.**—Quassia is very destructive to flies and insects. A concentrated solution is poisonous to the lower animals, and caused serious symptoms of narcotism in a child of 4 years, as mentioned by Potter.

In the dose of about $\frac{1}{4}$ grain, Campardon found quassin to produce severe headache, burning pain in the throat and œsophagus, sickness of stomach, vertigo, restlessness, diarrhœa, frequent passage but diminished secretion of urine.

Quassia is a simple bitter, without astringency; it is a good stomachic, and increases the appetite.

Quassin has been exhibited as a stomachic and tonic in the dose of $\frac{1}{30}$ to $\frac{1}{3}$ grain.

**Therapy.**—This drug is used as a tonic in dyspepsia, where it probably exerts both a tonic and an antiseptic action. Quassia is likewise useful in diarrhœa dependent upon indigestion.

It can be given with iron on account of the absence of tannic acid, and often has aromatics combined with it to improve the taste. It is useful during convalescence to stimulate the appetite, and may be combined with an alkali and given before meals. In children, an infusion of quassia is a useful agent as an enema to destroy thread-worms.

**QUERCUS ALBA** (U. S. P.).—**White-Oak Bark.**

**Dose,** fʒss–j, in fluid extract or decoction.

**Pharmacology.**—The bark of Quercus alba (Cupuliferæ) contains **Quercitannic acid,** and a bitter principle, **Quercin**; also **pectin,** coloring matter, etc. There are no official preparations; but a decoction (℥j–Oj) is usually employed, and a fluid extract made with diluted alcohol is obtainable, but they are rarely used internally. Oak-galls from Quercus lusitanica also contains tannin, and, as they answer a similar purpose, they are more convenient for use than the white-oak bark.

**Physiological Action and Therapy.**—A decoction of white-oak bark is occasionally used as an injection or wash in leucorrhœa; also in sore throat and nasal catarrh, but stains clothing, and may be substituted by solutions of tannic acid. The applications of tannic acid have been already considered. The powdered bark is an ingredient in tooth-powders; it was also formerly used as an absorbent application to ulcers and as a poultice in gangrene.

A concentrated fluid extract of quercus albus is, according to the method devised by Heaton, injected into the margin of the inguinal ring for the radical cure of hernia.

**QUILLAIA** (U. S. P.).—**Quillaia, Soap-Bark.**

*Preparations.*

*Pulvis Quillaiæ.*—Powdered Quillaia. *Dose,* gr. x–xxx.

*Extractum Quillaiæ Fluidum.*—Fluid Extract of Quillaia. *Dose,* ♏xv–fʒss.

*Tinctura Quillaiæ* (U. S. P.).—Tincture of Quillaia (20 per cent.). *Dose,* fʒi–ij.

*Decoctum Quillaiæ.*—Decoction of Quillaia (5 parts in 200). *Dose,* fʒi–ij.

*Saponin.* *Dose,* gr. ss–ij.

**Pharmacology.**—The bark of the Quillaia saponaria (Rosaceæ), a tree of moderate size, a native of Chili, is brought to this country in flat pieces several inches wide and from 2 to 3 feet in length. The outer surface is brownish white, the inner whitish and smooth. It has a splintery fracture. It is destitute of odor, but is very acrid to the nasal passages. The infusion of saponaria, when shaken, froths like soap. This property depends upon the presence of an irritant, poisonous glucoside called **Saponin,** which has been found in a number of vegetable species and genera, and is probably identical with polygalin. Dr. Hesse has determined that saponin derived from quillaia bark is identical with that from other sources and with senegin. Saponin was isolated in 1850 by LeBœuf. It is a white, crystalline powder, the taste of which is at first sweet and afterward acrid. Saponin is slightly soluble in water, but more readily soluble in strong and boiling alcohol. The solutions of saponin froth when shaken. Its saturated alcoholic solution is a solvent for gums, resins, and oils, with which, after being mixed with water, it forms permanent emulsions. Another constituent, quillaiac acid, possesses the property of precipitating albumin from urine.

**Physiological Action.**—The powder of soap-bark and solutions of saponin are strongly irritant to the Schneiderian membrane and excite sneezing. In weak solutions, saponin is a local anæsthetic; in concentrated form, it is a protoplasmic poison, and its local action destroys the energy of nervous and muscular tissue. Saponin exerts a specific influence upon the alimentary tract, since even intra-venous injections give rise to gastro-enteritis. Schroff found that 2½ to 3 grains of saponin produced irritative cough and secretion of mucus in the bronchial tubes, lasting for several hours, but no effect was manifested upon either the kidneys or skin. Saponin reduces the force and frequency of the heart's action, and finally paralyzes it.

**Therapy.**—It is principally as a topical remedy that quillaia has been employed, but, although its range of application is limited, it exhibits decided power. Quillaia* is an excellent stimulant to chronic ulcers and chronic eczema, the affected parts being covered by a roller-bandage which has been saturated in an infusion of soap-bark. The same preparation is of value in hyperidrosis and bromidrosis. The hands and feet may be advantageously bathed in this solution every day or every second day, while the axillæ or face can be mopped by a sponge which has been dipped in the infusion. In dandruff and simple pityriasis, the watery solution of soap-bark is an efficient application. The tincture may be employed where more powerful action is required, as in chronic eczema or alopecia circumscripta, in which conditions it will often prove superior to the tincture of green soap. Piffard recommends a mixture of fluid extract of soap-bark with glycerin in certain forms of acne. A decoction of soap-bark is not unpleasant to the taste and has been given to children as an expectorant instead of senega.

**QUINIMA.**—For quinine and its associated alkaloids and preparations, see Cinchona.

**RESINA** (U. S. P.).—**Resin** or **Rosin, Colophony.**

*Preparations.*

*Ceratum Resinæ* (U. S. P.).—Resin Cerate (resin 35, yellow wax 15, lard 50 parts).

*Emplastrum Resinæ* (U. S. P.).—Resin Plaster, Adhesive Plaster (resin 14, lead plaster 80, yellow wax 6 parts; spread on muslin).

*Linimentum Terebinthinæ* (U. S. P.).—Turpentine Liniment (resin cerate 65, oil of turpentine 35 parts).

**Pharmacology.**—Resin is the solid residue after distilling off the volatile oil from turpentine. (See Terebinthina.) It enters into several official cerates and plasters, to which it gives adhesiveness. Resin is insoluble in water, but soluble in alcohol, ether, fixed and volatile oils.

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* See paper by author "On a Natural Soap and its Use in the Treatment of Diseases of the Skin," *The Medical Bulletin*, July, 1879.

**Physiological Action.**—It is slightly irritating to the skin, and internally is antiseptic and slightly astringent in its effects upon the alimentary canal.

**Therapy.**—Resin has been employed as a domestic remedy for diarrhœa, a few grains finely powdered being given every hour or two, but it is seldom used internally by regular practitioners. The fumes coming from boiling resin may be inhaled in chronic bronchitis and winter-cough. Resin cerate, or basilicon ointment, as it is sometimes called, is a popular dressing for ulcers, promoting cicatrization and granulation. Compound resin cerate, or Deshler's salve (Pharm. 1870), no longer official, contains crude turpentine, and is more stimulating than the plain cerate; it is sometimes applied to blisters to prevent their healing too quickly and to promote suppuration.

**RESORCINUM** (U. S. P.).—**Resorcin.**
**Dose,** gr. x–xv to ℥j.

*Preparations.*

*Unguentum Resorcini.*—Ointment of Resorcin.
*Pheno-Resorcinum.*—Pheno-Resorcin (carbolic acid 67, resorcin 33 parts).

**Pharmacology.**—Resorcin is obtained by fusing certain gum-resins with caustic potash. The process for obtaining it from gum ammoniac has already been described. (See Ammoniacum.) It is now prepared on a large scale synthetically. It crystallizes in small, colorless prisms or plates, has a neutral reaction, a sweetish taste, with slight pungency or acidity, and an odor which resembles that of carbolic acid. Resorcin melts at 219.2° F. and distills at 512.6° F. It was discovered by Hlasiwetz and Barth.

Resorcin is an oxyphenol, homologous with orcin, derived from benzol by the substitution of two hydroxyl groups for two atoms of hydrogen. Chemically, it is meta-di-hydroxy-benzol, $C_6H_4(H_2O_2)$. Resorcin, when exposed to light and air, acquires a yellow-brown or reddish-pink color. It is soluble in water and other solvents, except chloroform and carbon disulphide. The best vehicles for medicinal purposes are alcohol, glycerin, and syrup of orange. The dose usually is from 5 to 15 grains; a drachm may be given at a single dose as an antipyretic. It is a most efficient antiseptic and antiferment. Andeer recommends butter as a vehicle for making an ointment (1 per cent.) extemporaneously.

Resorcin may be tested by dissolving in a solution of potassium hydrate, warming, and adding a few drops of chloroform, bromoform, a few crystals of chloral or bromal-hydrate. An intense ruby-red color is produced.

**Physiological Action.**—Resorcin is non-irritant to the skin, and, injected subcutaneously, causes very little inflammation and no suppuration. In strong solutions, it irritates mucous membranes and sometimes vesicates them. In full doses (30 to 60 grains) resorcin acts as an antipyretic, reducing the temperature for two or three hours, but at the same time has the disadvantage of causing nausea, oppression, languor, and free perspiration. Above these amounts it is not safe to go, since by larger doses cerebral symptoms are induced, such as deafness, vertigo, confusion of vision, convulsions (clonic and tonic), rigidity of the muscles of the back of the neck. Death has in several instances been caused in children by washing out the stomach with a 3-per-cent. solution of resorcin; in one case hæmoglobinuria was produced. In lower animals, death occurs from failure of respiration and paralysis of motor tracts in the spinal cord. It is excreted chiefly by the urine, which it darkens or even changes to a bluish color; the addition of tincture of ferric chloride to such urine causes it to become a dark-violet color. Symptoms of poisoning in man are best treated by diffusible stimulants and diuretics; atropine and strychnine might be given hypodermically.

**Therapy.**—The decided antiferment and antiseptic qualities of resorcin, with its solubility and not unpleasant odor or taste, make it a valuable application for the throat and nose in diphtheria;* it may also be administered internally to disinfect the gastro-intestinal tract, and thus prevent reinfection. It is furthermore of service to impregnate the atmosphere of the sick-chamber by the spray of a 5-per-cent. solution of the same agent. In erysipelas, puerperal fever, and septicæmia, resorcin has been used, both locally and internally, with marked benefit. A 2-per-cent. solution makes a spray for various catarrhal and other affections. In saturated ethereal solution, resorcin acts as a slight caustic, especially to raw surfaces or mucous membranes. The powder may be dusted on granulations or combined with boric acid (1 to 20 or 1 to 10); it is very efficient in discharges from the ear. The ear should be thoroughly cleansed with a solution of boric or carbolic acid, and dried; after this the above powder can be blown into the canal. To foul ulcers and sloughing wounds an ointment containing 1 or 2 drachms of resorcin to the ounce is an excellent application. Chancroids and ulcerated syphilitic lesions receive decided benefit from the same preparation. A concentrated alcoholic solution of resorcin is an efficacious local application to leukoplakia. A 1- or 2-per-cent. watery solution of resorcin is of service in acute or chronic conjunctivitis and wounds of the cornea. It is likewise a beneficial application to tuberculosis of the larynx, to mercurial and other forms of stomatitis, and to thrush. In whooping-cough and hay fever this remedy is advantageously used in the form of a spray, a 2-per-cent. solution being efficacious in the former disease, while in hay fever the solution has been made as strong as 20 per cent. Moncorvo, who introduced this method of treating whooping-cough, is accustomed to use a chemically-pure solution of resorcin in sterilized water and apply it to the peri-laryngeal mucous membrane by means of a thick brush of fine hairs attached to a handle of flexible iron wire. Applications are made every two or three hours during the day. Resorcin ointment has been employed with good effect in certain diseases of the skin, as chronic eczema, psoriasis, alopecia circumscripta, and lupus erythematosus. In the abortive treatment of herpes, M. Leloir employs the following solutions (*Medical News*):—

| | | |
|---|---|---|
| ℞ | Resorcin., | ʒss. |
| | Cocain. hydrochloratis, | gr. viij vel xxx. |
| | Acidi tannici, | ʒiss. |
| | Alcohol. (90 per cent.), | f℥iij.—M. |

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* "Resorcin in Diphtheria," *Centralblatt f. d. gesammte Therapie*, Heft 9, 1890.

Or,—

| | | |
|---|---|---|
| ℞ Cocain. hydrochloratis, | | gr. xv. |
| Ext. cannabis Indicæ, | | ʒ iiss. |
| Spt. menth. pip., | | f ʒ iiss. |
| Alcohol. (90 per cent.), | | f ℥ ij.—M. |

M. et ft. sol.

Petrini obtained good results in acne rosacea, after the pustules had been opened, by the application of the following preparation:—

| | |
|---|---|
| ℞ Resorcin., | gr. xv. |
| Ichthyol. | ʒ ss. |
| Collodii flexil., | f ℥ j. |

M.

Resorcin-soap (5 or 10 per cent.) has been found useful in ringworm of the scalp and other parasitic skin diseases, as first used by Julius Andeer. According to the observation of Dr. Jamieson a resorcin-salicylic superfatted soap shortens the desquamative stage of scarlatina. In a series of cases, washing the skin with this soap and warm water reduced the period of desquamation by two weeks. For seborrhœic eczema Dr. Eddowes recommends:—

| | | |
|---|---|---|
| ℞ Resorcin., | | ʒ ss–ʒ j. |
| Glycerin., | | ♏ x–xx. |
| Acet. cantharid., | | f ʒ iij. |
| Ol. amygdal., | | f ℥ iv. |
| Sp. odorat., | | f ℥ j. |
| Sp. vini rectif., | | f ℥ iij–v. |
| Aquæ, | q. s. ad | f ℥ viij. |

M: This forms a pleasant local application and relieves itching.

In the treatment of extensive patches of tinea versicolor Dr. E. Bodin employs an ointment thus composed:—

| | | |
|---|---|---|
| ℞ Resorcini, | | |
| Acidi salicylici, | āā | gr. xv. |
| Sulphur. precip., | | gr. lxxv. |
| Lanolin, | | |
| Vaselin., | | |
| Sebi., | āā | ʒ vj. |

M. ft. ungt.

Resorcin is preferable to carbolic acid for internal administration, and can be given as an antiferment in dyspepsia and digestive disorders. In gastric catarrh, gastralgia, and ulcer of the stomach, resorcin has rendered good service. It may be likewise used with success to allay nausea and vomiting and has been given with advantage in sea-sickness. In gastric ulcer it relieves pain and checks hæmorrhage.

Professor W. H. Thomson, of New York, has prescribed it in this class of cases as follows:—

| | | |
|---|---|---|
| ℞ Resorcini, | | ʒ ij. |
| Tr. aurant. cort., | | |
| Glycerini, | | |
| Syr. zingib., | āā | f ℥ ss. |
| Aq. menth. pip., | q. s. ad | f ℥ vj. |

M. ft. sol.

Sig.: Two teaspoonfuls in wineglassful of water after meals.

It is also serviceable in the diarrhœa of children. A solution of resorcin has been successfully employed as an injection in gonorrhœa and for washing out the bladder, there being but little danger from absorption of the remedy. Pheno-resorcin is soluble, forming a liquid with 10 per cent. of water, and may be used like carbolic acid. In epithelioma of the skin, resorcin has given excellent results in the hands of Dr. Mario Luciani, who reports two cases of cutaneous epithelioma in which he claims to have effected a complete cure by the application of an ointment containing resorcin. He used the following formula:—

℞ Resorcini, . . . . . . . . . . ʒ iiss.
Petrolati, . . . . . . . . . . . ℥j.
M. Sig.: Apply once a day to the ulcerated surface after previously cleansing with a 2-per-cent. watery solution of borax.

One case, a woman of 48 years, with an ulcer upon her forehead, was cured in three months; and in another, 60 years of age, with the same disease upon her lip of about a year's duration, this simple treatment was followed by an equally happy result. No microscopic examination appears to have been made in either case in order to establish the diagnosis (*Journal American Medical Association*). In doses of 10 to 25 grains resorcin reduces the pyrexia of tuberculosis.

**Pesopyrin.**—This compound is prepared by precipitating antipyrin with a molecular proportion of resorcin. The substance is insoluble in water and crystallizes from alcohol in colorless rhombic crystals.

**Eucalypto-resorcin.**—This combination has been made by M. Barbey by placing eucalyptol in contact with resorcin in excess. The body is insoluble in chloroform, from which it is deposited in the form of interlacing crystals. The crystals are insoluble in water, very soluble in alcohol and ether, volatilize at 100°, giving off a strong odor of camphor.

**Resorcinol.**—Dr. Bielaiew obtains a combination which he terms resorcinol by heating together equal parts of resorcin and iodoform. Resorcinol is an amorphous, yellowish-brown powder, having an odor resembling that of iodine. It has been used upon leg-ulcers, unhealthy wounds and syphilitic lesions. Resorcinol has been employed in the form of a powder, weakened with 4 parts of starch or as an ointment in the strength of 30 to 60 grains to an ounce of lard. Resorcinol is, however, a bad name for this compound since the same designation has sometimes been given to resorcin in reference to its phenol character.

## RETINOL.

**Pharmacology and Physiological Action.** — **Retinol**, or Resinol ($C_{35}H_{16}$), is a liquid hydrocarbon, obtained by the dry distillation of colophony. It is of a brown or yellowish color, has the consistency of a fat, and has a slightly bitter taste; its reaction is slightly acid on account of the presence of traces of picric acid. It forms a varnish-like coating over a surface when applied. It shares the antiseptic properties of the other balsams, and possesses the additional advantage of dissolving a great number of active substances, such as oil of cade, camphor, naphthol, balsam of Peru, salol, iodol, aristol, chrysarobin, cocaine, etc. Retinol mixes with fats, oils, lanolin, glycerin and petrolatum. By mixing with a proper proportion of colophony, with oak-leaves or sodium borate, a mass can be obtained sufficiently adhesive to allow it to be made into suppositories for vaginitis, etc.* Retinol is non-irritating when applied to the skin, and is an excellent vehicle for medicaments in cutaneous diseases. It does not become rancid and is unchangeable by time or light. The price is moderate.

**Therapy.**—M. Barbier gives a number of formulæ for its use, from which the following are taken:—

| | |
|---|---|
| ℞ Retinol., | ʒiiss. |
| Lanolini, | ʒj gr. xv. |
| Sodii bicarbonatis, | gr. ij. |

M. et ft. unguentum.

This is used in the ophthalmological clinic of Dr. Hubert for conjunctivitis, simple or gonorrhœal affections of the lids, the tear-ducts, and for the preparation of dressings and protection of instruments; or the following, of greater consistence, may be ordered:—

| | |
|---|---|
| ℞ Retinol.,<br>Resinæ,<br>Lanolini, | āā ʒij. |

M. et ft. unguentum.

In diphtheria, the following has been used as a topical application:—

| | |
|---|---|
| ℞ Retinol., | ℥ss. |
| Camphoræ, | gr. xxx. |
| Naphthol., | gr. xv. |

M. et ft. ung.
Sig.: Apply to the affected areas.

| | |
|---|---|
| ℞ Retinol., | ℥ij. |
| Beta-naphthol., | ʒiss. |
| Saponis viridis, | ℥ij. |
| Cretæ preparatæ, | ʒiij. |

M. Sig.: Apply to affected parts, for scabies.

In some skin affections, the following may be used with advantage:—

| | |
|---|---|
| ℞ Retinol., | ʒij. |
| Glycerit. amyli, | ʒiij. |

M. Sig.: For external application as directed.

Or this:—

| | |
|---|---|
| ℞ Retinol.,<br>Ol. cadini, | āā ʒiv. |

M. Sig.: For psoriasis, chronic eczema, etc.

M. Vigier† states that retinol gives excellent results in vaginitis and in blennorrhœa, as a topical application in the proportion of 6 per cent. The effects of this mixture are beneficial also in chronic cystisis, but in acute cases it often acts as an irritant. Desnos reports very favorably of the use of a 5- to 10-per-cent. solution of salol in retinol in the treatment of subacute cystitis. The solution is injected into the bladder where it remains, exerting a local influence, for a number of hours. For a vaginal tampon Bar recommends that gauze be boiled in a strong aqueous solution of carbolic acid and, after having been dried, dipped in the following mixture:—

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* Drs. Balzar and Chevalet, *La Médecine Moderne*, April 24, 1890.

† "Du Retinol et de son Emploi en Médecine," par F. Vigier. *Journal de Médecine de Paris*, November, 1890, page 641.

℞ Retinol., . . . . . . . . . . . . ℥ij.
Ceri alb., . . . . . . . . . . . . ʒiss.
Iodoformi, . . . . . . . . . . . ℥j.
M.

It is antiseptic, unirritating, and, in a large number of skin diseases, it gives excellent results either alone or as an antiseptic excipient for other substances.

## RHAMNUS CATHARTICUS.—Common Buckthorn.

### *Preparations.*

*Extractum Rhamni Catharticæ Fructus Fluidum.*—Fluid Extract of Buckthorn-Berries. *Dose,* fʒi-iss.

*Rhamni Catharticæ Succus.*—Buckthorn-Juice. *Dose,* ♏xv–fʒj.

*Syrupus Rhamni Catharticæ.*—Syrup of Buckthorn (buckthorn-juice with ginger, sugar, allspice, and alcohol). *Dose,* ʒi–ij.

**Pharmacology.**—The fruit of the common buckthorn, Rhamnus catharticus (Rhamnaceæ), is decidedly cathartic and cholagogue; the bark also has these properties, and, this species being naturalized in this country, probably it is often substituted for the official frangula-bark, which is the alder buckthorn, an allied species of Rhamnus. (See Frangula.) Cascara sagrada, or Rhamnus purshiana, is another variety of the same species. The fruit is purplish black, and, when dried, is about the size of a pea; the pulp contains four seeds; odor slight; taste nauseating, bitter, and acrid. The active principle is **Rhamnocathartin,** an amorphous, yellow, brittle substance.

**Physiological Action.**—All the species of Rhamnus possess purgative properties of greater or less activity, but some are much more violent in action than others. Nausea, vomiting, and severe griping pains often attend their purgative action, to avoid which aromatics are usually added, as in the syrup, which formerly was largely used in Europe, but not in this country to any extent. The common buckthorn likewise produces extreme dryness of the mouth and throat.

**Therapy.**—The preparations of Rhamnus catharticus are used for the same purposes as frangula, but are more severe in their action than the next variety to be considered. It may be employed in dropsy, and was formerly used in the treatment of gout and rheumatism.

## RHAMNUS PURSHIANA (U. S. P.).—Cascara Sagrada.

**Pharmacology.**—Rhamnus purshiana (Rhamnaceæ) is a shrub or small tree, 10 to 20 feet high, growing on the Pacific coast, and is sometimes known as the California buckthorn. The bark is the portion used, and an analysis by Prof. A. B. Prescott* showed its chief constituents to be a bitter, brown resin; a red resin, a light-yellow resin; tannic, malic, and oxalic acids; a neutral, crystallizable substance; a volatile oil, wax-starch, and a fat oil of yellowish color. Professor Wenzell also distinguished a glucoside, and Meier and Webber a peculiar ferment.

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* New Preparations, February, 1879, page 27.

Leprince has extracted from the bark a substance which appears to be the active principle and which he calls cascarin. It occurs as prismatic needles of a variable orange color, the hue depending upon the degree of hydration. Cascarin is devoid of odor or taste, soluble in caustic potash, soda or ammonia, alcohol and chloroform, slightly soluble in ether but insoluble in water. According to M. Phipson, cascarin is identical with rhamnoxanthin derived from Rhamnus frangula.

**Physiological Action.**—Cascara sagrada is not a purgative so much as it is a laxative with tonic properties, the latter being attributable to the bitter principle. In a number of clinical cases, Mr. Milnes Hey has noticed that it also produced a sensible diuretic effect. Cascarin appears to have a slight cholagogue effect. It causes an easy evacuation of the bowels without griping, does not excite nausea or diarrhœa, nor is its use followed by constipation. Cascarin may be given in the dose of $1\frac{1}{2}$ grain to 15 grains.

**Therapy.**—Cascara sagrada, in the form of fluid extract (in doses of ♏xv three times daily), is useful in chronic constipation. The dose should be gradually increased until the bowels are moved naturally once daily, and the remedy can then be given less frequently and the dose reduced. It is a peculiarity of this drug that it is not a cathartic, and its use should be preceded by a dose of castor-oil to clear the alimentary canal. It has the advantage of producing natural motions of the bowels by its tonic action upon the intestinal glands, increasing secretion and peristalsis. The dose is reduced after the natural condition of the bowels is established; it does not require to be given in increasing quantities, as do the ordinary resin-bearing cathartics. It also is a valuable hepatic tonic in congested liver and in duodenal catarrh. Cases of indigestion, with furred tongue, sallow skin, eructations of gas, constipation, are benefited by the following prescription:—

| | | |
|---|---|---|
| ℞ Ext. rhamni purshianæ fl., | | f℥j. |
| Glycerini, | | |
| Elixir. aromat., | āā | f℥ss. |

M. Sig.: Take from one-half to one teaspoonful, directly after eating, three times daily, until the symptoms are relieved.

A combination made use of by Dujardin-Beaumetz in cases of chronic constipation is:—

| | | |
|---|---|---|
| ℞ Extr. rhamni pursh. fl., | | f℥iij. |
| Glycerin. pur., | | f℥iij. |
| Alcohol (90°), | | f℥vj. |
| Syrup. simpl., | | f℥xij. |
| Ol. aurantii, | | gtt. vj. |
| Ol. cinnamomi, | | gtt. ij. |
| Aq. destill., | q. s. ad | Oj$\frac{3}{4}$. |

M. Sig.: Dose, one or two teaspoonfuls.

In cases of chlorosis, Luteaud gives:—

| | |
|---|---|
| ℞ Ammonii et ferri citrat., | 40 parts. |
| Ext. rhamni purshianæ fl., | 40 " |
| Saccharin., | 1 part. |
| Aquæ destillatæ, | 4000 parts. |

M. Sig.: A teaspoonful to be taken before each meal, for constipation.

In atony of the bowels, a combination with berberis aquifolium is useful:—

℞ Ext. rham. pursh. fl.,
Ext. berberidis aquifol. fl.,
Syrupi, . . . . . . . . . . . . . āā f℥j.
M. Sig.: Dose, a teaspoonful four times a day.

In constipation with gastric irritability, Dr. J. H. Bundy, who first introduced the remedy to the profession, proposed the following:—

℞ Ext. rhamni pursh. fl., . . . . . . . . f℥ss.
Ext. berberidis aquifol. fl., . . . . . . . . f℥j.
Acid. hydrocyanici dilut., . . . . . . . . fʒj.
Syrup. (vel ext. malti), . . . . . . q. s. ad f℥iv.
M. Sig.: Teaspoonful after meals and at bed-time.

According to the experience of J. C. Stephens, cascara sagrada is an efficient tæniafuge.

**Special Forms.**—Where the bitterness is an objection we may use the Cascara Cordial of Messrs. Parke, Davis & Co., in which the taste is well covered by aromatics, or the fluid-extract formula of 1887 (P., D. & Co.) may be used. This tasteless preparation is permanent, will not precipitate, and is entirely soluble in water. The solid extract of cascara sagrada makes a pill-mass which does not soften or decompose when made up with powdered marshmallow. Messrs. Parke, Davis & Co. also prepare a concentrated preparation, Cascarin (formula 1887), which is presented in scale form, is not hygroscopic, is readily reduced to powder, almost tasteless, soluble in water, and contains only the active principles of the drug. (Dose, gr. ¼–½.)

**RHEUM** (U. S. P.).—**Rhubarb.**
**Dose**, gr. i–xx.

*Preparations.*

*Extractum Rhei* (U. S. P.).—Extract of Rhubarb. *Dose*, gr. ii–x.

*Extractum Rhei Fluidum* (U. S. P.).—Fluid Extract of Rhubarb. *Dose*, ♏x–fʒj.

*Mistura Rhei et Sodæ* (U. S. P.).—Mixture of Rhubarb and Soda (fluid extract rhubarb 15, fluid extract ipecac 3, sodium bicarbonate 35, glycerin 350, spirit of peppermint 35, water q. s. ad 1000 parts). *Dose*, fʒj.

*Pilulæ Rhei* (U. S. P.).—Rhubarb Pills (each gr. iij). *Dose*, one to three pills.

*Pilulæ Rhei Compositæ* (U. S. P.).—Compound Pills of Rhubarb (rhubarb, aloes and myrrh). *Dose*, one to three.

*Pulvis Rhei Compositus* (U. S. P.).—Compound Rhubarb-Powder (rhubarb 25, magnesia 65, and ginger 10 parts). Gregory's Powder. *Dose*, ʒss–j.

*Syrupus Rhei* (U. S. P.).—Syrup of Rhubarb. *Dose*, for a child, fʒj.

*Syrupus Rhei Aromaticus* (U. S. P.).—Spiced Syrup of Rhubarb (aromatic tincture of rhubarb and simple syrup). *Dose*, f℥ss.

*Tinctura Rhei* (U. S. P.).—Tincture of Rhubarb. *Dose*, ℥ss.

*Tinctura Rhei Aromatica* (U. S. P.).—Aromatic Tincture of Rhubarb (rhubarb, cinnamon, cloves, nutmeg, glycerin, diluted alcohol, and water q. s. ad 1000 parts). *Dose*, fʒi–vj.

*Tinctura Rhei Dulcis* (U. S. P.).—Sweet Tincture of Rhubarb (rhubarb, liquorice, anise, cardamom, glycerin, diluted alcohol, and water q. s. ad 1000 parts). *Dose*, fʒi–vj.

*Vinum Rhei.*—Wine of Rhubarb (rhubarb 10, calamus 1, and stronger white wine q. s. ad 100 parts). *Dose*, fʒi–iv.

*Tinctura Rhei Aquosa* (N. F. and Ph. G.).—Watery Tincture of Rhubarb, or Compound Infusion of Rhubarb (rhubarb 100, borax 10, potassium carbonate 10, macerated for ten minutes with boiling water 850 ; then add alcohol 120, and after one and a quarter hours express and filter; add through the filter cinnamon water 125 parts. Each fluidrachm represents 5⅔ grains of rhubarb). *Dose*, fʒi–vj.

*Tinctura Rhei et Gentianæ* (N. F.).—Tincture of Rhubarb and Gentian (each fluidrachm represents rhubarb, gr. iv, and gentian, gr. j.). *Dose*, fʒi–℥ss.

**Pharmacology.**—Rhubarb is the root of Rheum officinale and of other undetermined species of Rheum (Polygonaceæ). Its habitat is China. The European rhubarb, R. rhaponticum, is not one-half as active and is not recognized by the pharmacopœia. The peeled and dried root of the Chinese or East India rhubarb, of a light color and good odor, should only be used in medicine; powdered rhubarb is inferior, and, if not adulterated, at least is largely made up of inferior, damaged, and worthless or worm-eaten rhubarb. The active principles are a glucoside called **Chrysophan,** with **Chrysophanic acid, Phæorhetin, Emodin, Erythrorhetin, Aporhetin, Rheotannic and Rheumic acids.** The grittiness of rhubarb is due to crystals of calcium oxalate contained in the root.

**Physiological Action.**—When taken into the mouth, rhubarb has a peculiar, bitter, slightly astringent taste, and increases the flow of saliva; in the stomach and intestinal tract the secretions are likewise increased and the peristaltic movements stimulated proportionately to the size of the dose, but after the first effects have been displayed the secretions are reduced by the secondary astringent action of the drug. The resinous constituents act upon the liver, increasing the quantity of bile; according to Rutherford, it is a certain though not a powerful hepatic stimulant. The bile secreted under its influence has the normal composition, and it is, therefore, a true cholagogue. The coloring matter is largely excreted by the kidneys, and the urinary flow is increased. The color may resemble that of urine which contains bile, but may be distinguished from the latter by becoming purplish-red on addition of an alkali.

In small doses, up to 5 grains, rhubarb is a stomachic tonic, which makes it a valuable constituent in dinner pills to aid digestion and prevent constipation. As a purgative, in doses of ½ drachm to a drachm, it acts slowly and in the course of seven or eight hours produces copious yellow stools containing bile. Griping may be due to the drug itself, or to the bile which is poured out under the action of its resinous constituents, notably phæorhetin. The cathartic principles may be absorbed through the integument, when applied on a poultice or spongio-piline; it is, therefore, a systemic purgative. These purgative constituents are excreted by the liver mainly, but also by the intestinal glands, the kidneys, and skin. After a woman has taken a dose of rhubarb, her milk may contain enough of these principles to purge the nursing child, and may acquire a yellowish tinge from the presence of the coloring matter of the drug.

Powdered rhubarb has been successfully employed as a dressing to chronic ulcers, but more powerful remedies have generally taken its place.

A case has been reported in which the internal administration of rhubarb gave rise to a hæmorrhagic eruption of macules, pustules and blebs. The mucous membranes were also affected and free hæmorrhage took place from the urethra.

**Therapy.**—Rhubarb is a good stomachic purgative, especially in the treatment of children's disorders caused by errors in diet, rich food, etc. The spiced syrup of rhubarb in teaspoonful doses may be given to an infant with indigestible food or curd in its stomach, or when its gastro-intestinal tract contains mucus from bronchial catarrh, etc. The mixture of rhubarb and soda is a good antacid and carminative for babies suffering with colic and cramps. In adults, it may be given with special advantage in hot water, fifteen or twenty minutes before eating meals, especially in cases of gastric catarrh. In summer diarrhœas of adults or infants, the irritation arising from the presence of unsuitable or undigestible food is at once relieved and the cause removed by a dose of the aromatic syrup or tincture of rhubarb. Where there is intestinal dyspepsia and colalgia or cramps, the sweet tincture will be found very efficient and acceptable. Rhubarb may be combined thus:—

| | | |
|---|---|---|
| ℞ Pulv. rhei, | | ʒ iss. |
| Sodii bicarb., | | ʒ ij. |
| Spiritus ammonii aromat., | | fʒ iij. |
| Spiritus myristicæ, | | fʒ vj. |
| Infus. carophylli, | ad | f℥ viij. |

M. Sig.: A half to a tablespoonful three or four times a day.

In children with acid discharges from the bowels, the combination with magnesia is especially useful. In weak digestion with deficient secretion, small doses of the tincture are valuable:—

| | | |
|---|---|---|
| ℞ Tinct. rhei, | | fʒ ij. |
| Tinct. cardamom. co., | | |
| Elixir. aromatic., | āā | f℥ ss. |

M. Sig.: Take twenty to forty drops before each meal.

Sidney Martin finds small doses of rhubarb efficacious in ascarides, his prescription being:—

| | |
|---|---|
| ℞ Tr. rhei, | ♏xx. |
| Magnes. carbonat., | gr. iij. |
| Tr. zingiber., | ♏j. |
| Aquæ, | fʒ iij. |

M. Sig.: To be taken at a dose. Repeat two or three times daily, according to the effect.

Urticaria due to indigestion may sometimes be relieved by rhubarb. It is a useful ingredient in purgative pills, where a cholagogue effect is desired, especially where hæmorrhoids are present:—

| | |
|---|---|
| ℞ Massæ hydrarg., | gr. vj. |
| Ext. rhei, | gr. iij. |
| Ext. colocynth. co. | gr. vj. |
| Saponis, | gr. ss. |

M. et ft. pil. no. iij.

Sig.: To be taken at bed-time, and followed in the morning by a teaspoonful of Rochelle salt in water before breakfast.

Constipation and hæmorrhoids, dependent upon pregnancy, are benefited by the administration of rhubarb. This remedy is considered by some practitioners as of special value in gouty subjects. Rhubarb has been known to cause a macular or vesicular rash.

### RHŒAS.—Red Poppy.

*Preparations.*

*Extractum Rhœados Fluidum.*—Fluid Extract of Poppy-Flowers. *Dose,* ♏xxx–fʒ iss.

*Syrupus Rhœados.*—Syrup of Red Poppy. *Dose,* fʒ i–ij.

**Pharmacology and Therapy.**—The petals of the red poppy, Papaver rhœas (Papaveraceæ), cultivated in gardens, contain a coloring matter and **Rhœadine**, but probably no morphine. The preparations are used as coloring agents in pharmacy; although doses are quoted above, the remedy is seldom, if ever, employed. The taste is mucilaginous and bitter, it may act as a simple bitter, as a stomachic tonic during convalescence.

**RHUS AROMATICA.—Fragrant or Sweet Sumach.**

**Dose,** ♏v–fʒiss, in fluid extract.

**Pharmacology.**—The bark of the root of Rhus aromatica (Anacardieæ), growing in the eastern portion of this country, contains a resin, volatile oil, and tannin.

**Physiological Action.**—Rhus aromatica is astringent, tonic, stimulant, and diuretic.

**Therapy.**—Sweet sumach has been used as an astringent in diseases of the kidneys and genito-urinary tract, as in cystitis and hæmaturia. It is likewise said to check menorrhagia and night-sweats. It is employed in atonic diarrhœa or summer dysentery, after a preliminary purge to remove offending substances from the alimentary canal. It has been lauded as a remedy for nocturnal enuresis of children, a drachm of a good fluid extract being administered in diminished doses during the day. In larger doses this drug has exerted a good effect in hysterical enuresis. In diabetes, both mellitus and insipidus, it has also proved of service.

**RHUS GLABRA** (U. S. P.).—**Sumach-Berries.**

*Preparation.*

*Extractum Rhois Glabræ Fluidum* (U. S. P.).—Fluid Extract of Rhus Glabra. *Dose,* fʒi–ij.

**Pharmacology.**—The fruit of Rhus glabra (Anacardieæ), a common shrub along the roadsides in the United States, contains **tannic acid,** besides potassium and calcium malates and a red coloring matter.

**Therapy.**—It is a good astringent in the form of decoction, or fluid extract, for a mouth-wash or gargle in stomatitis, spongy gums, or pharyngitis, and as a topical application in skin diseases and ulcers in domestic practice. The following is a useful gargle for sore throat:—

| | |
|---|---|
| ℞ Potassii chloratis, . . . . . . . . . . | ʒij. |
| Ext. rhois glabræ fl., . . . . . . . . . | f℥ss. |
| Glycerini, . . . . . . . . . . . | f℥iss. |
| Aquæ rosæ, . . . . . . . . . . . | f℥iv. |

M. Sig. Add a tablespoonful to a wineglassful of water, and use as a gargle, frequently.

Rhus glabra is rarely used internally, but has been given for catarrhal disorders of the stomach and bowels, with diarrhœa.

**RHUS TOXICODENDRON** (U. S. P.).—**Poison-Oak, Poison-Ivy.**

**Pharmacology.**—The fresh leaves of Rhus radicans (Anacardieæ), indigenous to the eastern portion of North America, contain a volatile acid, **Toxicodendric acid,** tannin, etc. As the volatile acid is the chief constituent, the fresh leaves only are used; dried leaves are worthless. Several other species of rhus, as the swamp-sumach (R. venenata), contain this constituent. The lac or varnish upon Chinese or Japanese boxes is made of some species of sumach, and very susceptible individuals may be poisoned by handling them, or by being present when such varnish is used. The rhus radicans is not a distinct species from rhus toxicodendron, which is sometimes erect and sometimes climbing. The poison-sumach may be recognized by trifoliate, compound leaves, resembling the ordinary ivy in having adventitious roots along the under side of the climbing stem, with the exception that in the poison-sumach the roots are given off in bunches at the nodes opposite the insertion of the petiole or leaf-stem, while in the ivy they grow from the entire under side of the stem. It is distinguished from the Ptelea trifoliata by having petiolate instead of sessile leaflets. The poisonous principle resides especially in the juice, which is acrid and milky, turning black upon exposure to the light.

**Physiological Action.**—The fresh leaves are very irritating to the skin, although the effect is much more marked in some individuals than in others. In characteristic cases of poisoning there is set up an acute dermatitis, with a great deal of œdema and hyperæmia of the skin; frequently vesicles or blebs are formed, accompanied by much irritation and itching. This inflammation resembles erysipelas, spreading from the parts first affected to surrounding skin and mucous membrane. With this there is considerable general disturbance, pains in the abdomen, nausea and vomiting; diarrhœa or diuresis may occur, with passage of blood. Fever and profuse perspiration may also be observed, with pains in the joints and lumbar region. The effects of the poison last from a week to a fortnight, and are followed by free desquamation of the affected surface.

**Poisoning.**—Many remedies have been advocated; the free application of a carbolized alkaline wash to neutralize the poison, such as Dobell's solution, followed by fluid extract of grindelia diluted with water (1 to 10) or distilled extract of hamamelis, will give as good results as any other.

Professor Wormley, of the University of Pennsylvania, recommends a mixture of 1 part of carbolic acid, 6 parts of sodium bisulphite and 100 parts of water. The fluid extract of Virginia snake-root is said to be advantageous by Dr. W. O. Wilkes. Dr. S. B. Straley, of Huntsville, N. J., has found that a strong decoction of chestnut leaves applied to the affected part every few hours has a very beneficial effect in reducing heat, itching and smarting. Other remedies which have been used with good effect are, decoctions of white or black oak bark, or dusting the surface freely with powdered aristol. Relief may also be afforded by the use of lime water or Labarraque's solution. An infusion of lobelia, in the proportion of an ounce to the pint of water, also is of service in this condition of local poisoning. Dr. R. L. Hinton extols an infusion of sassafras-bark. Compresses saturated in the cold infusion are applied to the affected surface, and the warm infusion is given internally, sweetened or with milk. When the inflammation is in the face, and accompanied by much swelling of the eyelids, alum curd is very efficient.

**Therapy.**—Rhus toxicodendron is rarely used by regular practitioners, although Phillips declares that it is useful in rheumatic pains and affections of fibrous tissues; also in certain skin affections, erythema, erysipelas, herpes and, pemphigus. In rheumatic paralysis it is claimed to be efficient. Dr. E. Carmichael Rothrock considers rhus toxicodendron as an excellent cerebral and spinal stimulant.

Externally, half a drachm of the tincture (1 to 2 of alcohol) in a pint of water may be used as a stimulating application, with advantage, for sprains, chilblains, burns, stings of insects, etc.

A tincture (1 part of the dry leaves to 5 parts, by weight, of alcohol) of rhus radicans, or poison-ivy, is recommended by Dr. Saint-Phillipe, of Bordeaux, as a good remedy in the nocturnal enuresis of children. He administers to children under 6 years of age, 5 drops of this preparation night and morning.

### RICINI OLEUM (U. S. P.).—Castor-Oil.

**Dose**, fʒj–℥j.

**Pharmacology.**—Castor-oil is a fixed oil, expressed from the seeds of Ricinus communis (Euphorbiaceæ), cultivated largely as an ornamental plant in our gardens, coming originally from India. The oil should be obtained without heat simply by crushing and pressing the seeds. It consists mainly of ricinoleic acid, combined with the base glyceryl as **Ricinoleate of glyceryl**, together with other fixed oils, a resin, and possibly an alkaloid, **Ricinine** (not purgative), and an acrid, drastic principle. It is a colorless, rather viscid, oily liquid, of faint, peculiar odor, and a bland, nauseating, acrid taste. It is soluble in an equal part of alcohol. It is a good addition to liniments on account of its density, and enters into the compound liniment of mustard and flexible collodion. Castor-oil is completely soluble in absolute alcohol, which is employed as a test for the detection of impurities. Pure castor-oil dissolves in spirit of 0.838 specific gravity at a temperature between 38° and 43° C. (100.4° to 109.4° F.), while foreign oils only dissolve at a considerably higher degree.* According to the investigations of H. Meyer, the purgative properties are due to pure ricinoleic acid and its glyceride, the ricinoleates of calcium and barium, and ricineloidic acid. Castor-oil is soluble in ether. The seeds from which it is expressed contain a highly irritant principle termed ricin, which renders them poisonous and three seeds have been known to occasion fatal gastro-enteritis in a man.

**Physiological Action.**—When applied to the skin no irritation results; on the contrary, it is borne by the conjunctiva, acting as a protective and sedative. The nauseating taste is largely due to its odor, and it can be taken much better if the nose be held during the act of swallowing. The odor may also be overcome by peppermint and other flavoring agents. As a purgative, it is classed as a laxative in small doses (♏x–fʒj), becoming more active in full doses (f℥ss–j). The laxative effect results about four hours after administration. Castor-oil will sometimes have a purgative action when rubbed upon the abdomen of young children.

**Therapy.**—Castor-oil may be used as a menstruum to retain drugs in contact with the surface. The following is a suitable formula:—

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* J. Arthur Wilson, in *American Journal of Pharmacy*, December, 1890.

| | |
|---|---|
| ℞ Olei ricini, | f℥ss. |
| Spiritus vini rectificati, | f℥ij. |
| Tinct. cantharidis, | f℥j. |
| Spiritus rosmarini, | f℥j. |
| Spiritus odorati, | ad f℥viij.—M. |

A drop of castor-oil in the eye will often relieve the irritation caused by a particle of sand, or by granular lids. Dr. S. Mitchell has found a solution of cocaine in castor-oil to be an excellent application to corneal ulcer, relieving pain and healing the lesion after other solutions had been used in vain. Fomentations of the mammary glands with castor-oil plant leaves, wilted with hot water, are useful in promoting the secretion of milk. A fluid extract made from the leaves has been used in the same manner and also given by the mouth; a decoction has been employed in amenorrhœa.

Castor-oil as a purgative is useful in children, and in pregnant women, for piles or fissures of the anus, or after parturition, acting without any irritant effect, according to Brunton; but this is denied by Fordyce Barker, who, from clinical experience, declares that it is not suitable for such cases, and in pregnancy or after parturition aloes is a preferable purgative. Castor-oil is a good vermifuge, and should be given before and after the administration of other anthelmintics. In acute diarrhœa or dysentery, treatment should commence with 1 or 2 drachms of oil, combined with 5 to 10 minims of laudanum. This removes irritating substances and soothes the intestines. Dr. Young, of Florence, has successfully treated acute diarrhœa with small doses of castor-oil, and suggests the following formula:—

| | |
|---|---|
| ℞ Olei ricini, | ♏xxiv. |
| Sp. chloroformi, | fʒiss. |
| Morphinæ hydrochlor, | gr. j. |
| Pulv. acaciæ, | ʒiiss. |
| Syr. simplicis, | f℥ss. |
| Aquæ, | q. s. ad f℥iv. |

M. Sig.: A dessertspoonful every hour and a half for an adult.

Phillips, also, has found the above mixture efficacious. In chronic dysentery, Brunton recommends 15 minims of castor-oil with 5 to 10 minims tincture of opium, given three times daily, or used thus:—

| | |
|---|---|
| ℞ Ol. ricini, | fʒss. |
| Tinct. opii, | ♏x vel xxx. |
| Syr. sarsaparillæ vel Aquæ menth. pip., | f℥iss. |
| Pulv. acaciæ, | q. s. |

M. Sig.: A teaspoonful or two three or four times a day.

A teaspoonful of oil will greatly relieve an infant suffering with bronchial catarrh.

**Special Forms for Administration.**—It may be given in soft capsules, which can be obtained of any size from 10 minims to ½ ounce. If the oil be given the first thing in the morning, an hour before breakfast, 10 or 20 drops are generally sufficient to open the bowels. This dose may be given in a teaspoonful of peppermint-water and brandy, the proportion being such that the oil neither sinks nor swims in the mixture.*

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* Brunton's Pharmacology, Therapeutics, and Materia Medica, 1885, p. 938.

Lemon- or orange-juice, coffee, froth of porter or beer, are also used as vehicles, but the best is the extemporaneous dose prepared at the soda-water fountain. The following mixture is recommended by a contributor to the *American Druggist*.* In it the disagreeable taste of the oil is replaced by a pleasant flavor of almonds :—

| | |
|---|---|
| Castor-oil, . . . . . . . . . . . . | 30 parts. |
| Bitter almonds, . . . . . . . . . . | 2 " |
| Sugar, . . . . . . . . . . . . | 30 " |
| Gum tragacanth., . . . . . . . . . | ½ part. |
| Orange-flower water, . . . . . . . . | 10 parts. |
| Water, . . . . . . . . . . . . | 120 " |

The only drawback to this mixture is that it requires a good deal of it for a dose, a teaspoonful of the oil being contained in about five teaspoonfuls of the mixture. The taste of codliver-oil is tolerably well disguised by highly-seasoned beef-tea. R. R. Mitchell advises for the same purpose a mixture of equal parts of the oil, aromatic syrup of rhubarb, and cascara cordial. Dr. Wabah McMurray, of Sydney, Australia, says, to disguise the unpleasant taste of castor-oil, a good idea is to ask the patient to take fʒj cream in the mouth and apply it with the tongue over the entire surface. This prevents the oil from adhering to the mucous membrane. The taste is said to be disguised by hot milk, one part of the oil being shaken up with four of the milk. According to a method devised by Toellner and Bergmann, the finest castor-oil is repeatedly treated with hot water, sweetened with sufficient saccharin to give it the flavor of syrup and the last trace of its original taste disguised by small quantities of oil of cinnamon and essence of vanilla. In children with griping diarrhœa and green stools containing casein, to disguise the taste of the oil and act well, Dr. McMurray recommends the following combination :—

| | |
|---|---|
| ℞ Ol. ricini, . . . . . . . . . . . | fʒj. |
| Mucil. acaciæ, . . . . . . . . . . | q. s. |
| Tinct. opii, . . . . . . . . . . . | ♏v. |
| Aquæ menth. pip. vel | |
| Aquæ chloroformi, . . . . . . . . . | f℥ij. |

M. Sig.: A teaspoonful every four hours.

A formula for a palatable castor-oil is thus given by N. J. Pritzker :—

| | |
|---|---|
| ℞ Ol. ricini, . . . . . . . . . . . | f℥iij. |
| Vitelli ovi, . . . . . . . . . . . | no. j. |
| Ol. amydal. amar., . . . . . . . . . | gtt. ij. |
| Lactis, . . . . . . . . . q. s. ad | ℥iv. |

The oil should be added slowly to the egg-yelk, triturating thoroughly, and the other ingredients are afterward added. The mixture can be taken in milk, syrup or wine. The taste may also be masked by mixing the oil with an equal part of glycerin and adding two or three drops of the oil of cinnamon or of gaultheria to each dose.

### ROSA.—Rose.

*Preparations.*

*Rosa Centifolia* (U. S. P.).—Pale Rose. The petals of Rosa centifolia (Rosaceæ).

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* *Boston Medical and Surgical Journal*, February 12, 1891, p. 175.

*Rosa Gallica* (U. S. P.).—Red Rose. The petals of Rosa Gallica collected before expanding.

*Oleum Rosæ* (U. S. P.).—Oil of Rose ("attar of rose"). The volatile oil distilled from the fresh flowers of Rosa Damascena (Rosaceæ).

*Aqua Rosæ* (U. S. P.).—Rose-Water.

*Aqua Rosæ Fortior* (U. S. P.).—Stronger Rose Water.

*Unguentum Aquæ Rosæ* (U. S. P.).—Rose-Water Ointment, or Cold Cream.

*Extractum Rosæ Fluidum* (U. S. P.).—Fluid Extract of Rose (from red roses). *Dose*, ♏v–fʒj.

*Confectio Rosæ* (U. S. P.).—Confection of Rose (red rose, sugar, honey, and stronger rose-water.

*Mel Rosæ* (U. S. P.).—Honey of Roses.

*Syrupus Rosæ* (U. S. P.).—Syrup of Roses. As a vehicle.

**Pharmacology.**—Red rose contains **tannic** and **gallic acids** and a **volatile oil**, which the pharmacopœia directs shall be obtained from another species. Red rose is an ingredient in the pills of aloes and mastic. In the British Pharmacopœia an acid infusion of rose appears, which is an agreeable mouth-wash. It is made with dried red-rose petals, broken up, ¼ ounce; dilute sulphuric acid, 1 fluidrachm; boiling distilled water, 10 fluidounces. This preparation may be given internally, in the dose of 1 or 2 fluidounces, and is, in effect, but an agreeable method of administering sulphuric acid.

**Physiological Action and Therapy.**—Preparations of rose are somewhat astringent. They are used as agreeable flavoring agents and vehicles. The confection is a good base for pills. The compound infusion is of service for overcoming the bad taste of magnesium sulphate. Aqua rosæ is a favorable vehicle for eye-washes and urethral injections, for cosmetic preparations. Rose-water ointment is an elegant, bland unguent, principally used as an excipient, but available in superficial burns, chapped lips or hands, abrasions, and erythema.

## ROSMARINUS.—Rosemary.

### *Preparations.*

*Oleum Rosmarini* (U. S. P.).—Oil of Rosemary. *Dose*, ♏i–v.

*Spiritus Rosmarini.*—Spirit of Rosemary (1 to 60). As a perfume. *Dose*, ♏i–v.

**Pharmacology.**—The leaves of Rosmarinus officinalis (Labiatæ) are aromatic, pungent, and bitter. They contain **volatile oil** (about 1 per cent.), some resin, tannin, and a bitter substance. Rosemary enters into aromatic wine, perfumed spirit, or eau de Cologne, soap liniment, and compound tincture of lavender.

**Physiological Action.**—Rosemary is stimulant, diuretic, carminative, emmenagogue, and somewhat diaphoretic, but is now rarely employed in substance, the oil taking its place. The latter is stimulant and carminative. It reduces temperature, imparts a peculiar odor to the urine, and in large quantities has caused death. It is chiefly used as a rubefacient in liniments and ointments.

**Therapy.**—In alopecia from defective nutrition of hair-bulbs, a lotion containing oil of rosemary and tincture of cantharides, with Cologne water, is frequently given. It may also be used as a rubefacient for sprains and painful joints, and is efficacious in the different forms of pediculosis. The compound rosemary ointment of the German Pharmacopœia contains 1 part each oil of rosemary and oil of juniper-berries in 30 parts of ointment, and is used in neuralgia, chronic rheumatism, and lumbago. The oil of rosemary is of some service as an internal remedy in hysteria accompanied by depressed spirits.

From $1\frac{1}{2}$ to 3 drachms of the **Rosmarinum sylvestre,** dried and powdered, taken as an infusion, are said by Sznabl to produce a decided diaphoretic effect.

## RUBIDIUM.

### *Preparations.*

*Rubidii Iodidum.*—Rubidium Iodide. *Dose,* gr. v.

*Rubidii et Ammonii Bromidum.*—Rubidium and Ammonium bromide. *Dose,* gr. v–x or xx.

**Pharmacology.**—Rubidium is one of the rarer metals and belongs to the series of the alkalies. It is of a soft, wax-like consistence, is easily fused, readily unites with acids and haloids to form salts, and ignites spontaneously in the air. Its salts communicate a violet color to flame. The salts of rubidium possess a high electrolytic conductivity. Heretofore the cost of separating the metal from the substances with which it was found united in nature has been too great to allow its medicinal use. Recently, however, a new process has permitted its more economical production.

Rubidium iodide is the salt which has been almost exclusively used. It is a white, crystalline substance, which does not effloresce, is without odor and has a milder taste than potassium iodide. It is, moreover, more soluble in water than the corresponding salt of potassium.

**Physiological Action.**—The salts of rubidium exert a far less depressant action upon the heart than those of potassium. The iodide does not diminish appetite or impair digestion. It does not disturb the circulation. It is less apt than the corresponding salt of potassium to produce the phenomena of iodism. Rubidium chloride, according to Picket, causes death in animals by exhausting the nervous system and depressing the action of the heart.

**Therapy.**—Rubidium iodide has been used with advantage to fill many indications of the potassium salt, for which it will prove, in many instances at least, an efficient substitute. In the eye clinic of Professor Schöler, of Berlin, rubidium iodide in 5-per-cent. aqueous solution or vaseline ointment of the same strength has been successfully employed in affections where the action of an absorbifacient was demanded. Its internal use was conjoined, and Professor Bunge, of Halle, reports it of value in chronic inflammation of the eyes of a non-syphilitic nature, and especially in chronic optic neuritis. Internally, it has been chiefly given in visceral syphilis, gummata and late ulcerated lesions. Its efficacy is thought to be at least equal to that of potassium iodide. It has also been found of avail in chronic rheumatism and in the removal of old inflammatory exudations. A favorable report has also been made of its action in gonorrhœal rheumatism.

Rubidium and ammonium bromide was proposed by Laufenauer as a succedaneum for the older bromides upon the ground that it contained a larger proportion of bromine. He prescribed it in daily doses of 90 to 100 grains.

### **RUBUS** (U. S. P.).—**Blackberry.**

*Preparations.*

*Extractum Rubi Fluidum* (U. S. P.).—Fluid Extract of Rubus. *Dose,* f ʒss.

*Syrupus Rubi* (U. S. P.).—Syrup of Rubus (containing fluid extract, 25 per cent.). *Dose,* f ʒj–f ℥j.

*Syrupus Rubi Aromaticus* (N. F.).—Aromatic Blackberry-Syrup (blackberry, cinnamon, nutmeg, cloves, and allspice). *Dose,* f ʒi–iv.

*Elixir Rubi.*—Blackberry-Cordial, Blackberry-Brandy (fluid extract blackberry-root 5, aromatic fluid extract ½, brandy 13½, syrup of blackberries 17, elixir 17 parts). *Dose,* f ʒij–f ℥ss.

*Elixir Rub Compositum* (N. F.).—Blackberry Compound (blackberry-root, galls, and cinnamon, each 10 parts, with cloves, mace, ginger, in blackberry-juice and syrup). *Dose,* f ʒj–f ℥j.

*Cordialis Rubi Fructus.*—Blackberry-Cordial (fresh blackberry-juice 3, cinnamon, cloves, and nutmeg, in tincture with dilute alcohol, 2, simple syrup 3 parts). *Dose,* f ʒj–f ℥j.

**Pharmacology.**—The bark of the root of Rubus villosus, Rubus Canadensis, and Rubus trivialis (Rosaceæ) is official as Rubus. The wood should be rejected, only the bark being of medicinal value. It contains tannic acid (10 per cent.). The fluid extract is made by percolation with diluted alcohol, and contains glycerin (10 per cent.).

**Physiological Action.**—Blackberry is astringent.

**Therapy.**—In diarrhœa of relaxation, especially after cleansing the bowels with castor-oil, the preparations are useful. The combinations of the fruit for the table (jams, preserves, etc.) are not astringent, and are not only useless in treating diarrhœa, but also injurious, since the hard seeds increase the irritation. The best form is the fluid extract, but there is a popular demand for blackberry-cordials and blackberry brandy, for which formulæ are given above. They are pleasant to the taste, carminative, and slightly astringent.

### **RUBUS IDÆUS** (U. S. P.).—**Raspberry.**

*Preparation.*

*Syrupus Rubi Idæi* (U. S. P.).—Syrup of Raspberry. As a vehicle.

**Pharmacology.**—The fruit of Rubus idæus (Rosaceæ) has a pleasant flavor. It contains sugar, malic and citric acids, pectin, proteids, coloring matter, and a trace of volatile oil, consisting of compound ethers producing the peculiar flavor.

**Therapy.**—Its sole use in medicine is to prepare the syrup, which has a pleasant, acid taste and a fruity odor. The leaves of the wild raspberry (R. strigosus) contain tannin, and are used in decoction as an astringent in diarrhœa. Raspberry-syrup with vinegar is a grateful drink in hot weather, added to cold water.

### **RUMEX** (U. S. P.).—**Rumex, Yellow-Dock.**

*Preparations.*

*Extractum Rumicis Fluidum* (U. S. P.).—Fluid Extract of Rumex. *Dose,* f ʒss–j.

*Decoctum Rumicis.*—Decoction of Dock (fresh root, ℥ij, to water, Oj). *Dose,* f℥i–iv.

**Pharmacology.**—Rumex is the root of Rumex crispus, and of some other species of rumex (Polygonaceæ) growing along roadsides in Europe and America. The official root is 8 by 12 inches long, ½ inch thick, somewhat fusiform. It contains tannin, chrysophanic acid, mucilage, calcium oxalate, starch, etc.

**Physiological Action.**—Dock is alterative, tonic, and slightly astringent.

**Therapy.**—In strumous affections, especially enlargement of the glands and cutaneous disorders, rumex has been found particularly valuable. It is also considered antiscorbutic. In chronic laryngeal affections, with cough and soreness under the sternum, it will give relief. The decoction is sometimes employed externally in various skin diseases and glandular swellings. Also used internally in dyspepsia and liver disorders.

**RUTÆ OLEUM.—Oil of Rue.**

**Dose,** ♏ii–v.

**Pharmacology.**—Volatile oil distilled from Ruta graveolens (Rutaceæ, Ruteæ). Its color is light yellow, which becomes brown when the oil is long kept; the taste is sharp and bitter; the odor is aromatic, disagreeable, and distinctive. This oil is soluble in all proportions in absolute alcohol. The oil is obtained from the leaves, which also contain a yellow coloring matter called rutin. Rutin is a crystalline substance, and possesses acid properties.

**Physiological Action.**—Applied to the skin, oil of rue occasions hyperæmia, inflammation, and vesication. In ordinary doses it is carminative, and is a general stimulant to the circulation and the secretions. Large doses cause gastro-enteritis, convulsions, stupor, dimness of vision and contracted pupils, suppression of urine or strangury. Abortion may result from toxic doses. It has some special action upon the genito-urinary tract. Rue is eliminated, and may be recognized by its odor in the breath, urine, and perspiration.

**Therapy.**—The oil of rue is useful in amenorrhœa due to defective excitement of the ovaries, and in passive menorrhagia of debility or following abortion. Hysteria, especially when associated with amenorrhœa, is benefited by this remedy. It has been used with success in flatulence and infantile convulsions dependent upon that condition. Used as an abortifacient, in accordance with popular reputation, it has several times caused death from irritant poisoning, as above indicated. Rue is beneficial in defective activity of the sexual organs, acting as an aphrodisiac and as an emmenagogue. The irritant properties of the oil of rue have caused it to be sometimes used as a topical remedy. It is said to have the power of destroying warts. Phillips states that the bruised leaves of rue laid upon the forehead will often check epistaxis. Rue has been added to liniments for application to the chest in chronic bronchitis. A decoction of the fresh leaves may be employed as an injection to destroy ascarides. Rue has also been given internally in order to expel round worms.

### SABADILLA.—Cevadilla.

**Pharmacology.**—The seeds of Asagræa officinalis (Melanthaceæ), of Mexico and Central America, contain **Veratrine, Cevadine,** and **Cevadilline,** combined with **Cevadic** and **Cevadillic acids.** Two new alkaloids have been isolated by E. Merck, who has called them sabidine and sabadinine.

**Physiological Action and Therapy.**—An ointment has been used to destroy lice and other vermin, and as a cure for itch. The physiological effects are those of veratrine. (See Veratrina.) Cevadilla is a powerful emetic, cathartic, and anthelmintic, and has been given in doses of 1 to 5 grains. It is seldom now used, and its principal value is as a source of veratrine.

### SABAL SERRULATA.—Saw-Palmetto.

*Preparation.*

*Extractum Sabal Fluidum.*—Fluid Extract of Sabal. *Dose,* f℥ss-ij.

**Pharmacology.**—The Sabal serrulata, or saw-palmetto (Palmaceæ), grows abundantly along the sea-coast from South Carolina to Florida, and is found as far as 8 or 10 miles inland. This plant possesses a creeping and branched stem, leaves of a bright-green color, fan-shaped and spiculated. The roots, large and fibrous, extend several feet from the stem and are half exposed above the sand. The berries or drupes, of a dark-purple color and about the size of an olive, ripen in October and November. The seeds are very hard, and enveloped in a tough, fibrous membrane. The plant contains a volatile oil (soluble in alcohol), a fixed oil, and a large proportion of saccharine matter.

**Physiological Action.**—The taste, at first sweet, soon becomes acrid and pungent; to the pungent succeeds a smooth sensation, which extends from the tongue and mouth to the larynx and nasal cavities, all of which parts feel as if lubricated with oil. Saw-palmetto is said to increase appetite, digestion, and strength, and to promote nutrition. It also exerts a sedative and diuretic influence, and has been thought to have a special tonic effect upon the reproductive system. The berries seem to have nutrient value, as the animals who feed upon them rapidly fatten. The physiological action of saw-palmetto has not been systematically investigated.

**Therapy.**—Saw-palmetto is said to be an excellent expectorant, and, at the same time, a sedative to the mucous membranes of the respiratory tract. Troublesome nervous cough is allayed and secretion promoted by its use. This remedy has been employed with benefit in coryza, acute and chronic laryngitis and bronchitis. Bronchorrhœa with bronchiectasis is relieved by the administration of sabal serrulata. Dr. Read* states that an acute nasal catarrh may be aborted by two or three doses, and that the vapor is inhaled with advantage in chronic ozæna. Sabal is claimed to possess some efficiency in cardiac asthma. On account of its combination of tonic and expectorant properties it has been found of service in phthisis pulmonalis, and especially in tuberculosis of the larynx. Saw-palmetto is thought to be valuable in atrophy of the mammæ, testicles, or uterus, and to exert a beneficial influence upon enlarged prostate. This remedy is likewise recommended for functional impotence.

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* "Sabal Serrulata, Saw-Palmetto," by Dr. J. B. Read, of Savannah, Georgia. *American Journal of Pharmacy,* April, 1879, p. 169.

### SABBATIA.—American Centaury.

**Dose**, gr. xxx–ʒiss, in infusion or fluid extract.

**Pharmacology and Therapy.**—The entire flowering plants of Sabbatia angularis and of Sabbatia paniculata (Gentianaceæ) are used in medicine for the same purposes as gentian, columbo, and other simple bitters. A solid extract, obtained by evaporating the fluid extract and adding 5 per cent. of glycerin, may be given as a tonic in atonic dyspepsia in doses of gr. ii–xij.

### SABINA (U. S. P.).—Savine.

*Preparations.*

*Extractum Sabinæ Fluidum* (U. S. P.).—Fluid Extract of Savine. *Dose,* ♏v–xx.
*Ceratum Sabinæ.*—Savine Cerate (fluid extract 25, resin cerate 90 parts).
*Oleum Sabinæ* (U. S. P.).—Oil of Savine. *Dose,* ♏ii–v.

**Pharmacology.**—The tops of Juniperus sabina (Coniferæ), a small evergreen tree common in the northern hemisphere, often cultivated as an ornamental shrub. It contains a volotile oil, which, when separated by distillation, is official as oil of savine; also tannin, resin, etc. Oil of savine is colorless or yellowish, has a strong, characteristic smell and a burning taste. It is freely soluble in absolute alcohol.

**Physiological Action.**—Locally, savine causes rubefaction, or even vesication. Internally, it is a stimulant to the digestive organs, increases the action of the heart, and stimulates the bronchial, cutaneous, and renal secretions. It causes hyperæmia of the kidneys, of the ovaries and uterus, and, in large doses, excites strangury, hæmaturia, violent vomiting and purging, gastro-enteritis, unconsciousness, stertor, and convulsions. Savine may, as part of its toxic effects, cause abortion in a pregnant woman, and death has occasionally resulted from its irritant action when administered for this purpose. The odor of savine appears in the breath, sweat, and urine as elimination takes place.

**Therapy.**—Savine used to be added to blisters, or blistered surfaces were dressed with savine ointment, to increase the effect, but this practice is now obsolete. The cerate may be applied as a caustic for the destruction of warts. A mixture of powdered savine and verdigris has been successfully employed for the removal of condylomata. Powdered savine may be used as a stimulant to indolent ulcers. A cerate or ointment of savine is a serviceable counter-irritant in chronic gout or rheumatism. This drug is efficient in tinea capitis and scabies, and has been used internally with success as a tæniacide. As an emmenagogue, Phillips considers it highly valuable and safe, in proper doses. It is used in functional dysmenorrhœa, in passive hæmorrhages after abortion, and, as Whitla suggests, may prove beneficial in subinvolution of the uterus.

**SACCHARINUM.—Saccharin** (Anhydro-ortho-sulphamin-benzoic acid).

**Pharmacology.**—Saccharin is a coal-tar derivative, discovered in Professor Remsen's laboratory of Johns Hopkins University, and first described by C. Fahlberg in a communication to the *American Chemical Journal*, 1879 (vol. i, p. 436). It is a white crystalline powder, with an acid reaction, but an intensely sweet taste. Its odor, which becomes stronger on warming, is faintly suggestive of nitro-benzol. This substance is soluble in 500 parts of cold water, readily soluble in alcohol and ether. Saccharin dissolves also in glycerin. Its solubility in water is promoted by the addition of sodium bicarbonate in the proportion of 2 parts to 3 of saccharin. Commercial saccharin may contain a large number of impurities. Pure saccharin can be separated from the mixture by means of ether.

Saccharin forms soluble salts with the hydrates of carbonates of the alkaline metals. It melts at 220° C. (428° F.), and when fused with potassic hydrate it forms salicylic acid. One part dissolved in 70,000 parts of water imparts to the solution a distinctly sweet taste; it is about 300 times sweeter than cane-sugar, which it resembles in taste, except for a peculiar slight flavor of bitter almonds.

**Physiological Action.**—Saccharin is excreted by the kidneys unchanged; it is not decomposed in the body, and has little if any effect upon digestion, though the experiments of C. T. Fox have demonstrated that, when added to food, saccharin checks the action of saliva upon starch.

The only noticeable effects upon the urine are that it does not so readily undergo fermentation and the chlorides are slightly increased. Pure saccharin is not possessed of toxic or deleterious effects upon the human organism, even in doses as large as 75 grains. Saccharin has considerable antiseptic virtue, which, according to Constantine Paul, is impaired when it acts in an acid medium.

**Therapy.**—Saccharin is chiefly employed to take the place of sugar in the diet of obese and diabetic patients. For this purpose it is best prescribed in the form of a syrup containing 10 parts of saccharin and 12 parts of sodium bicarbonate in 1000 parts of distilled water, made with gentle heat at 40° C. (104° F.). It has also been claimed by Dreschfeld that saccharin relieves some of the symptoms of acid dyspepsia. Dr. James Little asserts that saccharin freely administered is an efficient remedy in chronic cystitis with ammoniacal urine. Two parts of saccharin dissolved by means of 3 parts of sodium bicarbonate are said to form an excellent tooth-wash. Fournier has found a mouth-wash containing saccharin efficacious in aphthæ. By Dr. Felici, of Rome, it has been utilized as an application in ozæna. The crusts having been removed by vaseline oil and the cavity cleansed with a saline fluid, a solution containing from 8 to 15 grains of saccharin is applied twice daily to the affected parts. The remedy was especially useful in cases where there was atrophy of the turbinated bones and mucous membrane and in those characterized by the odor and discharge of ozæna without apparent anatomical changes.

Saccharin is largely used in confectionery to add to glucose and make it correspond more closely in sweetness with cane-sugar. It may be prescribed with quinine, in order to overcome the bitterness:—

℞ Quinin. sulphat., . . . . . . . . . . . . ʒj.
Saccharin., . . . . . . . . . . . . . gr. xxx.
M. et div. in chartulæ no. xxx.
Sig.: Take one four times a day.

**SACCHARUM** (U. S. P.).—**Sugar, Saccharose.**

**Pharmacology.**—The refined sugar of Saccharum officinarum and various species or varieties of Sorghum (Gramineæ), or cane-sugar, the product of the sugar-cane, grown in sub-tropical countries, is a widely used article of food. Sugar is also obtained from one or more varieties of Beta vulgaris (Chenopodiaceæ). The official **syrup** consists of 85 parts of sugar and water q. s. ad 100 parts. Sugar is the basis of the syrups, conserves, and many other pharmaceutical preparations. With lime it forms a chemical combination,—the saccharate of calcium,—which is an **antidote to carbolic acid**; it is official as Syrupus Calcis.

According to Dr. Bossi, sugar has the power of exciting uterine contractions during labor. In a number of cases of inertia he administered an ounce dissolved in water with asserted good results.

**Saccharum lactis** (U. S. P.), sugar of milk, is a peculiar crystalline sugar obtained from the whey of cows' milk by evaporation, and purified by recrystallization. It is also known as **lactose**; cane-sugar is **saccharose**, and **glucose** is grape-sugar or starch-sugar. Sugar of milk is largely made in Switzerland from the whey remaining after making cheese. It is a white, rather gritty sugar, less sweet than saccharose, and has a neutral reaction. It is used in pharmacy as a diluent, on account of its hardness, in making triturates. Lactose enters into Dover's powder, saccharated pepsin, deodorized opium, and other preparations. According to Dr. Brush, it is very commonly adulterated.

Sugar of milk, in the daily dose of 2 to 4 drachms, given in an abundance of water, exerts a decided diuretic influence and may be serviceably employed in cases of renal inactivity or dropsy.

**Diabetin.**—Under this name levulose, a fruit-sugar, has been introduced as a food peculiarly adapted to the use of diabetic patients. Levulose is a pure white crystalline powder, soluble in water in almost every proportion. It has a sweet taste and leaves no disagreeable after-flavor. Diabetin possesses the same nutrient value as cane-sugar, and is assimilated in diabetes, a small proportion only being excreted by the urine. This substance has been used as a saccharine aliment in the disease named and has fulfilled an excellent purpose. Under its use the oxidation of carbohydrates is increased, and the proportion of sugar excreted in the urine is not augmented.

**SAGO.—Sago.**

**Pharmacology.**—Sago is a prepared starch from the interior of the stem of Metroxylon sagu or Sagus Rumphii (Palmaceæ) of the Indian Archipelago. It occurs in hard, whitish, spherical grains, which form a gelatinous mass with boiling water. Pearl sago is the best variety. An imitation sago is made from potatoes.

**Therapy.**—It is useful as an easily digested and acceptable article of food for the sick when added to broth, or in the form of light puddings.

**SAL-BROMALIDE** (**Salicylanilide-Bromacetanilide**).

**Dose**, gr. v–viij.

**Pharmacology.**—A combination of acetanilide, salicylic acid, and bromine, with the formula $C_5H_5NH[C_6H_4(OH)(CO)]+C_6H_4Br.NH,$-$CH_3CO$, has been introduced by Dr. S. Radlauer, of Berlin. It is a white, crystalline, granular powder, without odor, and almost tasteless. This substance is soluble in alcohol, dilute alcohol, and hot water, and almost insoluble in cold water; it is more soluble in water slightly acidulated with hydrochloric acid or in dilute solution of caustic potassa.

**Physiological Action and Therapy.**—Its physiological action is similar to that of other remedies of this class; it is antiseptic, antipyretic, and hypnotic. It resembles antipyrin in its effects upon the sensory nerves. Woodbury has used it clinically (1) to relieve pain; (2) to produce sleep; (3) to allay spasmodic cough; (4) to reduce fever; (5) to arrest fermentation in infectious dyspepsia. In the small doses usually given (gr. v–viij), it relieves headache and restlessness and produces natural sleep. It has not so much influence over high temperature as some of the other remedies of this class, but it does not produce sweating or cyanosis. In the treatment of influenza, or grippe, this salt reduces the fever and allays pain and restlessness. Where cough becomes spasmodic and paroxysmal, the sal-bromalide exercises a sedative effect and produces sleep. It is of advantage in whooping-cough (gr. i–ij every two hours) or in asthma, whether of cardiac or bronchial origin. It has been used in Germany, with successful results, in diabetes, reducing both the sugar and the amount of urine; and it is stated to be particularly serviceable in acute articular rheumatism. Sal-bromalide is of value in the treatment of neuralgia and allays nervous excitement.

**SALEP.—Salep.**

**Pharmacology and Therapy.**—The tubers of several species of Orchis (Orchidaceæ, Ophrydeæ) growing in Germany and France, collected in the autumn, deprived of epidermis and dried. They contain **bassorin** (48 per cent.), or vegetable mucilage, and **starch** (27 per cent.). With forty times its weight of boiling water, salep forms a thick jelly, which can be flavored and used as a nutritious article of food during convalescence from acute diseases and in bowel disorders.

**SALIX.—Willow, Willow-Bark.**

**Dose**, ʒj, or more, in infusion.

*Preparations.*

*Salicinum* (U. S. P.).—Salicin. *Dose*, gr. x–ʒij.
*Salol* (U. S. P.).—Phenyl Salicylate. *Dose*, gr. iii–ʒj.

**Pharmacology.**—The bark of Salix alba (Salicaceæ) and of other species of salix. The most important constituents are **Salicin**, a neutral principle, in white, silky crystals, of very bitter taste, and **tannic acid.** Salicin is a crystalline glucoside, which, by fusing with potassium hydrate, yields oxalic and salicylic acids. Salicin dissolves in water, alcohol, solutions of caustic potash and soda, and in glacial acetic acid. It is very sparingly soluble in ether and insoluble in chloroform.

Salicylic acid and the salicylates of sodium, lithium, and of physostigmine are also official. The oil of gaultheria, or of birch, also contains salicin as methyl salicylate, and may be used to obtain salicylic acid, which may also be made synthetically by combining phenol with carbon dioxide (Kolbe and Lautemann). Methyl salicylate is now official.

**Physiological Action.**—The bark is an astringent bitter toxic and antiperiodic. One variety, the **Salix nigra,** is considered a diuretic and sexual sedative, the fluid extract being used in doses of ♏xx–xxx several times a day. Salicin acts as a bitter tonic, with antiperodic and antiseptic powers. It is not toxic in the human subject, and is acceptable to the stomach. This agent is excreted mainly as salicyluric, salicylous, and salicylic acids by the kidneys. Salicylic acid has already been considered. Salicin is not entirely or always decomposed after absorption, as it has been found in the urine under its own form. Its escape from the body is slow.

**Therapy.**—Salicin is a useful, bitter tonic, in feeble digestion, in doses of 2 to 5 grains. In the diarrhœa of phthisis it is effective in restoring a more healthy condition and promoting digestion, and it also reduces the fever, given in doses of 20 grains, two or three times daily :—

℞ Salicin.,
Bismuth. subnit., . . . . . . . . . . āā gr. c.
Ol. cinnamomi, . . . . . . . . . . ♏j.
M. et ft. capsulæ no. xx.
Sig.: One or two capsules every hour or two for diarrhœa.

Salicin is a beneficial remedy in the chronic diarrhœa of children. In acute rheumatism, Maclagan considers it safer than salicylic acid, as it does not depress the heart, the dose being from 10 to 50 grains every three or four hours; or, in order to get the full antipyretic effect, these doses may be administered every hour until two or three are taken, and then less frequently. He also commends its use in neuralgia, and coryza. In full doses its antipyretic effect may be accompanied by free perspiration, but it is not toxic, and can be given in amounts of several drachms daily.

Dr. E. B. Turner praises the action of salicin in influenza, having treated more than 200 consecutive cases by means of this agent, which was given to adults in doses of 20 grains every hour for ten or twelve successive hours, and to children in proportionate quantities, according to their age. In pelvic pain, dependent upon or aggravated by a rheumatic diathesis, Jules Chéron has often found 15 grains of salicin, administered in three doses, of decided efficacy. In certain cases of metritis, salpingo-ovaritis, pelvic cellulitis or peritonitis, and in lumbo-abdominal neuralgia it may be given with advantage.

**SALOL.**—(U. S. P.).

**Dose,** gr. v–ʒj.

**Pharmacology.**—The combination of salicylic acid and phenol—the phenylic ether of salicylic acid—is sold under the trade name of salol. It consists of 60 parts by weight of the former and 40 of the latter. Salol is a white, crystalline powder, insoluble in water, odorless, and almost tasteless. It was first prepared by von Nencki in 1883, and introduced into practice in 1886 by Sahli. In the organism it becomes decomposed, yielding salicylic acid and carbolic acid in nascent form. It is antiseptic, germicide, and antipyretic to a more marked degree, and is proportionately less toxic than either of its constituents. Salol passes through the stomach unchanged. Its decomposition is effected, in the intestine, chiefly by means of the pancreatic fluid and partly, also, by the intestinal fluids. According to the experiments of Reale and Grande salol may, at least in some cases, be broken up in the stomach into its component parts. Salol is also decomposed by the action of pus, and the action of various bacteria.

It has been proposed to make use of salol as a coating for pills which are desired to act upon the bowel, the covering serving as a protection during the passage of the preparation through the stomach. When salol and camphor are gently heated together a colorless, syrupy liquid is produced, possessing a strong camphoraceous odor.

As impure salol has sometimes found its way into the market, the following is given as a ready test by which the purity of the product may be demonstrated. A few drops of nitro-sulphuric acid are placed upon a watch glass and a little salol added. A yellow color soon results and changes to brown, and subsequently to green, when stirred with a glass rod. When this has occurred the watch-glass is placed in a porcelain measure with about ¾ ounces of water. The mixture is then shaken. The liquid assumes a rosy color and the green hue returns if ammonia be added.

**Physiological Action and Therapy.**—It must not be forgotten that in administering salol internally the therapeutic effect is due to the salicylic acid and carbolic acid, and therefore that large doses cannot be given with impunity for fear of phenol poisoning. Salol is absorbed slowly and eliminated slowly, so that there is danger of accumulation in the system if given too frequently, except where diarrhœa is present. M. Josias has reported the case of a young girl who had taken 45 grains of salol in forty-eight hours, and in whom a large patch of scarlatiniform erythema together with rose-colored papules and spots resembling those of measles appeared in consequence upon various portions of the body. The insufflation of salol for the relief of otorrhœa has been known to cause extreme swelling of the external auditory meatus, the isthmus of the fauces and uvula. Josefowitsch reports the case of a man, 40 years of age, to whom 350 grains had been given in the course of four days, who suffered with intense albuminuria and violent pains in the loins. Black urine (carboluria) may continue for some time after its ingestion. Kobert insists that, from the large proportion of phenol which salol contains, it is, comparatively speaking, a toxic substance; so that any exceeding of the maximum dose must be regarded as hazardous. Dr. Hesselbach reports the case of a woman who died after taking 120 grains of salol within eight hours. It was found that she had been suffering with chronic nephritis, which was made acute by the drug. Dr. Hesselbach, from his study of the action of the agent, concludes that the large proportion of phenol contained in salol renders it such a toxic substance that its unrestricted therapeutic use is fraught with danger; and secondly, that in renal diseases, acute or chronic, salol is contra-indicated.* Dr. Chlapowski has recorded a case in which death resulted from the ingestion of 15 grains. In rare instances an erythmatous eruption has been produced by the local application of salol, probably in consequence of its decomposition.

Salol is an excellent dressing for wounds, burns, ulcers, erysipelas, and other cutaneous disorders. In impetigo contagiosa and pustular eczema, Egasse applies with advantage a collodion composed of:—

| | |
|---|---|
| ℞ Salolis, | gr. xlvj. |
| Cocain. hydrochlorat., | gr. iij. |
| Collodii flexilis, | ʒv. |

M.

A camphorated salol is highly esteemed by Cuirllier in the treatment of suppurative otitis. The meatus is first cleansed by means of a solution of boric acid, and the camphorated salol applied upon a tampon of wool, which is left in position not more than twenty-four hours.† For ozæna Cozzolini recommends:—

| | |
|---|---|
| ℞ Salol., | ʒij. |
| Acidi borici, | ʒj. |
| Acidi salicylici, | gr. xij. |
| Thymol., | gr. v. |
| Pulv. talci, | gr. iij. |

M. Sig.: Use by insufflation.

The formula for an excellent antiseptic powder, used in some of the hospitals, is given as follows:—

| | |
|---|---|
| ℞ Pulv. salolis, | ℥j. |
| Zinci sulphitis, | ℥iss. |
| Pulv. benzoini, | ℥ss. |
| Talci purificat., | ʒij. |
| Ol. fœniculi, | ♏xx. |

M. Useful for chronic ulcers, etc.

M. Valude recommends, in ulcer of the cornea, the application of a pad of salol gauze which, with a moistened gauze bandage, seals the eye and maintains a certain amount of compression. The eye is first carefully disinfected, the dressing placed in position and not removed for three or four days, when the ulcer is found to be in process of repair. M. Reynier employs a liquid mixture of salol and iodoform in the treatment of abscess cavities, bone cavities and fistulæ. Salol mixed with iodoform is liquefied under the influence of heat, but the mixture solidifies when it cools. When injected into a cavity, the mixture remains liquid and causes the gradual evacuation of the pus.‡

Reynier makes use of the same preparation in the treatment of laparotomy wounds.

In fermentative disorders of the stomach (dilated stomach especially), in intestinal dyspepsia, salol, in 2- to 5-grain doses, is remarkably effective in relieving the annoying symptoms of flatulence, pyrosis, pain, sick-headache, etc. In duodenal catarrh, or catarrh of the bile-ducts, with or without jaundice, good results are obtained from salol. Salol is regarded by Strizower as an excellent remedy in the treatment of cholelithiasis. It is said to favor the escape of calculi and retard their development. It is not given for the purpose of relieving colic, but in the intervals of attacks, in doses of 10 grains three or four times a day. It has been employed as a succedaneum for salicylic acid in diabetes.

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* "The Action of Salol on the Kidneys," *Therapeutic Gazette*, October, 1890, p. 704.

† *American Journal of Pharmacy*, January, 1891.

‡ *La Médecine Moderne; Medical Bulletin*, September, 1893.

This substance is of value in diarrhœa, and is strongly recommended by Moncorvo, of Rio Janeiro, in the malarial diarrhœa of children.

The following prescriptions containing salol are useful:—

℞ Salolis, . . . . . . . . . . . . ʒij.
Pulv. ipecacuanhæ et opii, . . . . . . . gr. xxiv.
M. et ft. chartæ no. xxij.
Sig.: A powder every hour or two until relieved of diarrhœa.

℞ Salolis,
Bismuth. subnit.,
Cretæ præparatæ, . . . . . . . āā ʒj.
M. et ft. chartæ no. xij.
Sig.: A powder every hour or two, for diarrhœa.

Cholera infantum, the diarrhœa of tuberculosis and of typhoid fever are also benefited by its administration. Dr. W. L. Carr has found it of decided service in the first stage of acute gastro-enteritis. In doses of 4 grains, suspended in mucilage, Drs. Lardier and Pernet have given salol with advantage in dysentery. Good results have been reported by several observers from the use of this remedy in Asiatic cholera. It seems very apt, however, to increase the gastric disturbance which accompanies cholera and, as shown by the case cited by Girode, this remedy should be used with great caution in ulcerous conditions of the alimentary tract.

Salol being excreted as salicylic acid, acts as a disinfectant to the urinary passages, and is useful in pyelitis, catarrh of the bladder, and ammoniacal urine. Dr. S. L. Abbott treated three cases of cystitis in women with salol (gr. x thrice daily or gr. v every three hours). Under its use the symptoms disappeared and the urine became acid, and the patients were cured after the failure of other remedies. Testimony to the same effect is given by Arnold, who remarks that it has afforded relief even in cases of tuberculous cystitis.

In pulmonary tuberculosis Grossi makes use of a solution of 1 part of salol in 3 parts of almond-oil, subcutaneously injected. M. Heiz reported twenty cases of blennorrhagia treated by salol, in which the disease lasted only ten or twelve days. In the same communication* he praises it highly in typhoid fever, giving it in doses of a drachm daily, combined with bismuth salicylate. In a series of forty-nine cases of typhoid fever treated by Posajnyi by salol, all of which were severe, the remedy produced marked amelioration in 75 per cent. while in the remaining cases it produced no good effect. In about one-fourth of the number the diarrhœa ceased after one or two days' exhibition of the drug and in some cases was succeeded by constipation. Salol is especially valuable in the treatment of acute rheumatism, given in 15- to 30-grain doses three or four times daily. It reduces the temperature and causes free perspiration, and is somewhat analgesic.

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* *Répertoire de Pharmacie*, July 10, 1890.

M. Gouguenheim says that salol has a very manifest action in suppurative sore throat (tonsillitis, etc.). Salol is valuable as an intestinal and urinary antiseptic. It is especially serviceable in cystitis, enlarged and irritable prostate, gonorrhœa, and gleet. In the treatment of diseases of the genito-urinary tract, salol can be prescribed as follows:—

| | |
|---|---|
| ℞ Salolis, | gr. c. |
| Terebeni, | ♏c. |

M. et ft. capsulæ no. xx.

Sig.: A capsule or two every two or three hours. For irritation of the genital organs. Valuable especially in gleet.

The following have also proved of service in gonorrhœa and gleet:—

| | |
|---|---|
| ℞ Salolis, | gr. c. |
| Ext. belladonnæ folior. alc., | gr. ij. |

M. et ft. capsulæ no. xx.

Sig.: From four to six capsules a day.

| | |
|---|---|
| ℞ Salolis. | gr. c. |
| Ergotinæ, | gr. xx. |

M. et ft. capsulæ no. xx.

Sig.: One or two capsules every two or three hours. For cystitis and in enlarged prostate.

Dr. J. William White* recommends salol given in capsules as follows in the treatment of recent anterior urethritis:—

| | |
|---|---|
| ℞ Salolis, | gr. iiiss. |
| Oleoresin. cubebæ, | gr. v. |
| Balsam. copaibæ (Para), | gr. x. |
| Pepsinæ, | gr. j. |

M. et ft. capsulæ no. j. Mitte no. xxx.

Sig.: One capsule four to six times daily.

This writer reports that the discharge thus treated in two-thirds of the cases ceased within a week. In the majority of patients he also recommended an injection of gr. ij of zinc sulphocarbolate in a 10- to 15-per-cent. solution of hydrogen dioxide.

Grautzoff, in addition to its internal administration in gonorrhœa, employs it as a injection according to the following formula:—

| | |
|---|---|
| ℞ Salol., | ʒiiss. |
| Pulv. acac., | gr. lxxv. |
| Aq. destillat., | Oiv. |

M.

Nicolaier has obtained satisfactory results in six cases of diabetes mellitus from the use of salol, giving 30 grains three times a day. An improvement generally resulted within eight days. In some of the cases the diet was not restricted, and this writer particularly recommends salol where an anti-diabetic regimen is, for any reason, impracticable. Lutz advocates the employment of salol in tuberculosis, and claims that it possesses special value in acute phthisis. He is of the opinion that the drug diminishes the disintegration of tuberculous material.

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* *The Philadelphia Medical News*, June 14, 1890.

**Salipyrin** is a combination of salicylic acid and antipyrin. This substance can be made by gradually adding 73.4 parts of salicylic acid to a boiling aqueous solution of 100 parts of antipyrin. On cooling, salicylate of antipyrin is thrown down in the form of colorless, transparent crystals or scales, which are very slightly soluble in cold water, but readily soluble in alcohol, ether, or chloroform. According to Hitschmann, it is only in rare instances that even large doses of salipyrin occasion a fall of blood-pressure.

The experiments of Alberto on frogs and toads show that small doses of salipyrin increase the power of the heart, medium doses produce arrhythmia, while large quantities cause arrest in diastole.

Salipyrin is used by Guttmann in doses of a drachm or more in twenty-four hours, given in doses of 15 grains, the first dose to be double (30 grains). It has decided antipyretic and analgesic action, and is especially useful in the pyrexia of rheumatism and intermittent fevers. Salipyrin has sometimes succeeded in cases of acute rheumatism after the failure of sodium salicylate and antipyrin. In other cases, again, it has not seemed to exert a decided influence. It seems to be of little avail in chronic rheumatism. In epidemic influenza it relieves the severe headache, and often has a decided sedative and hypnotic effect. Professor Mosengeil, of Bonn, esteems salipyrin of value in the treatment of catarrhal affections unrelated to influenza. He recommends that the remedy should be administered at the inception of the attack. In chronic nasal catarrh he has had good results from insufflation of powdered salipyrin. Hitschmann states that its most marked action is that of an analgesic. He has given it with benefit in chronic myelitis with lancinating pains in the lower limbs, in sciatica and other forms of neuralgia. He observes that it will sometimes cause derangement of the stomach or abundant perspiration. An eruption upon the skin and tinnitus aurium occurred in a few cases after its use. Kayser has employed salipyrin with advantage in a number of cases of uterine hæmorrhage. In nearly all the cases it produced a hæmostatic effect which continued for several days after the drug had been discontinued. It was particularly useful in menorrhagia preceding the menopause. Salipyrin has likewise been used with good effect in amenorrhœa.

**Salinaphthol** is a combination of salicylic acid with naphthol, analogous to salol. It is given in doses of gr. iii–viij, is insoluble in water, and devoid of taste and smell. This compound is also known by the names of naphthalol and betol.

The physiological action of salinaphthol is described in connection with beta-naphthol.

Salinaphthol seems less objectionable than salol, because the naphthol resulting from its decomposition is less poisonous than the phenol liberated by the latter; but thus far clinical evidence has not sufficiently accumulated to declare that it should in all cases be preferred to salol, which has been given in much larger doses.

**Salophen** is a new combination, which crystallizes in fine, white scales, is almost insoluble in water, readily soluble in alcohol and ether, and destitute of taste or odor. It contains 51 per cent. of salicylic acid. Upon being heated with soda-lye, it is split up into sodium salicylate and acetyl-para-amidophenol. This decomposition takes place also within the organism. The substance is not acted upon by the acid gastric juice, but decomposition takes place within the intestine. No deleterious by-effects have yet been observed from its use. It is regarded as of special value in the treatment of debilitated patients. Salophen is claimed to be much less toxic in its effects than salol. It can be administered to animals in the average quantity of 3 grains to the pound of body-weight. Salophen can be safely given to men, according to the investigations of P. Guttmann, in daily doses of 1½ to 2 drachms. Salophen is excreted by the fæces and also by the skin. After evaporation of the perspiration, crystals of salophen or of a product of its decomposition have been observed upon the skin by Professor Drasche, of Vienna. The surface glittered as if sprinkled with diamond dust. Dr. Hirschmann found that the administration of several other bodies belonging to the aromatic series (as sodium salicylate, acetanilid and phenacetin) was followed by an elimination in crystalline form. This result was noticed particularly after the use of phenacetin. An abundance of beautifully formed crystals was found upon the skin after the administration of 15 grains daily for three days.

Guttmann found salophen to have a favorable action in acute rheumatism, in some instances diminishing pain and swelling within a few days. Other cases, however, demanded weeks and months for their cure. It is unable to prevent relapse or extension to previously unaffected articulations. Later observers have substantially confirmed this judgment. In chronic rheumatism it will generally alleviate pain, but does not promote absorption of peri-articular exudations, nor does it prevent the cardiac complications of the disease.

Salophen is regarded as well adapted for use in diseases of children. It has been administered with advantage in scarlatina, typhoid fever, pneumonia and tuberculosis. The antipyretic power of salophen is but slight. In typhoid fever from 1 to 1½ drachms is needed in order to reduce the temperature 1° to 1½° C. In phthisis the exhibition of 45 to 60 grains causes a reduction. In two cases of cystitis the late Dr. Guttmann saw no improvement. Salophen has generally proved beneficial in neuralgia and, according to the studies of Dr. Edmund Koch, has an excellent analgesic effect in the most diverse nervous disorders. Salophen is particularly available in neuralgia dependent upon a rheumatic diathesis. On account of its value as an intestinal antiseptic it has been proposed to make use of salophen in cholera.

**Salacetol.**—This substance has been introduced as a substitute for salol, being devoid of the toxic properties of the latter compound. Salacetol is obtained by heating monochloracetone with sodium salicylate. It crystallizes from alcohol in the form of scales or lustrous needles. It is but slightly soluble in hot or cold water, but dissolves in hot alcohol, ether, chloroform, carbon disulphide, benzol and benzine. Its taste is slightly bitter and it melts at 160° F. Salacetol is broken up in the intestine into salicylic acid and acetol, the latter body being eliminated in the urine in the form of acetone. Salacetol is unchanged in passing through the stomach. The absorption of salacetol is promoted by the conjoined exhibition of castor-oil. The dose for an adult is from 30 to 45 grains and children can take 1½ grain for each year of their age. When incorporated with lard it is absorbed by the skin.

The virtues of salacetol have been studied by MM. Bourget and Barbey. They esteem it an excellent intestinal antiseptic and have given it with advantage in choleraic diarrhœa. The administration of salacetol in acute articular rheumatism causes a rapid decline of temperature and amelioration of pain. At the same time the writers quoted recommend an application to the joints composed of:—

℞ Acid. salicylic.,
Ol. terebinth.,
Lanolin, . . . . . . . . . . . āā ʒ iiss.
Adipis, . . . . . . . . . . . . ℥ iij.
M.

Salacetol has likewise produced good results in chronic and muscular rheumatism and, given in castor-oil, has been beneficial in cases of biliary lithiasis.*

**SALVIA** (U. S. P.).—**Sage.**

**Dose,** gr. x-xxx, in infusion or fluid extract (with diluted alcohol).

**Pharmacology.**—The leaves of Salvia officinalis (Labiatæ), a garden herb, used for its flavor in cooking; but the wild sage (Italian sage) is better for medicinal purposes. It contains from ½ to ¾ per cent. of volatile oil, **Salviol,** with tannin, resin, etc.

**Physiological Action.**—The infusion (ʒiv to Oj), of which the dose is from an ounce to a wineglassful, is tonic, astringent, and stimulant. The latter quality is increased in the fluid extract by the diluted alcohol, used as a menstruum. MM. Cadeac and Albin have demonstrated that the oil of sage gives rise to epileptiform convulsions in the dog.

**Therapy.**—Infusion of sage by itself is a very good gargle and astringent wash for the nose or mouth. Internally it has been administered for its tonic effects in fevers, and to check sweating, especially in phthisis pulmonalis. Sage may be combined with other remedies as an injection for urethritis or vesical catarrh. The compound sage-gargle consists of:—

℞ Aluminis, . . . . . . . . . . . ʒ iv.
Salviæ, . . . . . . . . . . . . ʒ j.
Mel despumati, . . . . . . . . . . f℥ ij.
Aquæ bullientis, . . . . . . . . . . Oj.
Ft. infusum et cola.
Sig.: Dilute with water and use as a gargle.

**SAMBUCUS** (U. S. P.).—**Elder.**

**Dose,** ℥ss–j, in infusion, drunk while hot.

**Pharmacology.**—The flowers of Sambucus Canadensis (Caprifoliaceæ), of North America, are stimulant and diaphoretic, and, to some extent, diuretic. The flowers are used for flavoring purposes. They contain a small proportion of a volatile oil, which has the odor of the flowers in a high degree; also valerianic acid, acrid resin, and mucilage.

**Physiological Action and Therapy.**—Elder-flower water is a good vehicle for lotions and eye-washes. In hot infusion the remedy acts as a stimulant, diuretic, and diaphoretic, and may be emetic if given in too large quantity. The berries are edible, and the juice is considered antiscorbutic and alterative; it is used in rheumatism and syphilis. Elder-berry jam or conserve is laxative. The inner bark of elder is cathartic, and, in large doses, emetic.

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* *Therapeutische Monatshefte*, December, 1893.

The physiological properties of elder bark have been studied by Combemale. Large doses of the decoction of the outer bark or of the whole bark produced decided polyuria in dogs. Moderate doses gave rise to no considerable increase of urine, but the temperature was lowered and the pulse and respiration retarded. The decoction of the fresh inner bark was strongly diuretic. Large doses acted very rapidly, and the effect continued for more than five hours. In the meantime, the temperature, after first rising slightly, sank to a tenth below the normal. The pulse also gradually became more slow. A maceration of the inner bark exerted much less influence upon the kidneys, but occasioned nausea and vomiting, with subsequently a severe diarrhœa, associated with reduction of the temperature and retardation of the pulse. A rabbit died after the injection of a large quantity of the whole bark. The autopsy showed intense injection of all the organs, with pulmonary hæmorrhages.

Dr. George Lemoine employed a decoction of the fresh inner bark therapeutically. Increased diuresis continued as long as the drug was used. The best effect was obtained in acute nephritis and the drug is capable of good service in ascites and œdema. In two cases an acute eruption upon the skin occurred, while elder bark was being taken, in one case of small furuncles, in the other an urticaria.

**SANGUINARIA** (U. S. P.).—**Blood-Root.**
**Dose,** gr. ii–xx.

*Preparations.*

*Acetum Sanguinariæ.*—Vinegar of Sanguinaria. *Dose,* ♏xv–xl (or as an emetic, f℥i–v).

*Tinctura Sanguinariæ* (U. S. P.).—Tincture of Sanguinaria (15 per cent.). *Dose,* ♏x–f℥j.

*Extractum Sanguinariæ Fluidum* (U. S. P.).—Fluid Extract of Sanguinaria. *Dose,* ♏v–xv.

**Pharmacology.**—The rhizome of Sanguinaria Canadensis (Papaveraceæ), collected in autumn, is about two inches long, cylindrical, reddish brown, containing small, red resin-cells; taste, very bitter and acrid. It contains three alkaloids, **Sanguinarine, Porphyroxine,** and **Puccine,** with **chelidonic** and **puccinic** acids. From the studies of König and Tietz it appears that sanguinarine is a mixture of several bases with resinous substances. As separated by them, sanguinarine is a colorless crystalline substance, soluble in alcohol and chloroform. Its salts are of a blood-red color.

**Physiological Action.**—The powder is extremely irritating to the air-passages, causing violent sneezing and free secretion. It is a feeble escharotic. The taste is harsh and bitter. Taken internally, it is a systemic emetic, its action being followed by salivation and much depression, causing also an increase of hepatic secretion. Sanguinaria may cause hypercatharsis and act as an irritant, acro-narcotic poison. It is emmenagogue and expectorant, and, after a preliminary increase of arterial tension, depresses the heart's action; death is produced by paralysis of the medullary, respiratory, and cardiac centres. The spinal reflexes are reduced and spinal centres finally paralyzed; the pupils become dilated, the muscles relaxed, the skin cold and clammy, with collapse of the vital powers; the fatal result often is preceded by convulsions, either of spinal origin or arising from carbonic-acid poisoning, due to failure of respiration.

**Antidote.**—The antidotes are diffusible stimulants,—digitalis, amyl nitrite, strychnine hypodermically, with morphine and atropine, if necessary, to relieve pain or severe nausea. The patient should be kept warm, and warm water may be used to wash out the stomach and bowels.

**Therapy.**—Blood-root has been used in powder as an application to ulcerated surfaces, and is regarded by some as a cure for cancer; but it is painful, and, if freely applied, may be absorbed and cause vomiting and other symptoms of poisoning. Keyser employs sanguinarine nitrate (Merck's) $\frac{1}{4}$ grain, with 1 ounce of glycerin, as a remedy for conjunctivitis granulosa. Powdered sanguinaria, snuffed or blown into the nose, is said to cure polypi, and may prove successful. A decoction may be used with advantage as a gargle in scarlatinal angina. An ointment containing blood-root has been successfully used in tinea. The powdered root is recommended by some as a sternutatory in nasal catarrh, and the treatment is certainly very effective, because the patient will not be likely to return for further treatment. The conjoined internal use of the tincture, dose 10 minims, thrice daily, is also advised. In small doses of the tincture (5 or 10 minims several times a day), it is considered valuable in atonic dyspepsia, gastric catarrh, or duodenal catarrh with jaundice. Large doses, a teaspoonful to a tablespoonful of the vinegar, or the tincture, causes vomiting, with increase of hepatic secretion. It has been used in croup as an emetic, but is too violent and too depressing.

In various spasmodic affections and disorders, accompanied by cough, as in pneumonia, asthma, bronchitis, etc., small doses of the tincture may be given at short intervals. Sanguinaria may be prescribed thus with expectorants for the diseases referred to :—

℞ Tinct. sanguinariæ, . . . . . . . . . fʒj.
Syrupi ipecac., . . . . . . . . . . f℥ss.
Tinct. lobeliæ, . . . . . . . . . . f℥j.
Glycerini, . . . . . . . . . . . fʒss.
M. Sig.: A teaspoonful every two or three hours, for subacute bronchitis.

℞ Tinct. sanguinariæ, . . . . . . . . . fʒij.
Ammonii bromidi, . . . . . . . . . ʒiij.
Spiritus ætheris nitrosi, . . . . . . . . f℥j.
Syrup. pruni Virg., . . . . . . . q. s. ad f℥v.
M. Sig.: Two teaspoonfuls in water every two or three hours, for asthma and in bronchitis.

**Sanguinarine** may be given as an expectorant in doses of gr. $\frac{1}{12}$-$\frac{1}{8}$ in pneumonia, bronchial catarrh, winter cough, etc., the alkaloid having the advantage of not disturbing the stomach, although its secretions are increased by fractional doses. A syrup of sanguinaria, made by adding sugar to the vinegar, may be used as an ingredient in cough mixtures (♏ v–xv) or as an emetic (f℥i–ij).

In hysteria, due to pain or moral causes, sanguinaria is said to be sometimes of advantage, either given alone or in combination with podophyllum.* For various functional affections of the genital system, amenorrhœa, dysmenorrhœa, and in impotence, with seminal incontinence and relaxation of the organs, sanguinaria is pronounced a serviceable remedy. Blood-root can be combined as follows, for the diseases named:—

| | |
|---|---|
| ℞ Tinct. sanguinariæ, | |
| Ext. hoang-nan fl., | |
| Ext. ergotæ fl., . . . . . . . . . . | āā f℥ij. |

M. Sig.: Twenty to forty drops in water three times a day, in amenorrhœa; useful also in impotence and seminal weakness.

| | |
|---|---|
| ℞ Sanguinariæ, . . . . . . . . . . | gr. ij. |
| Aloini, | |
| Extr. ignatiæ, . . . . . . . . . . | āā gr. ij. |
| Ferri lactatis, . . . . . . . . . . | gr. xx. |

M. et ft. pil. no. xx.

Sig.: A pill three or four times a day; beneficial as an emmenagogue and in genital debility.

Sanguinaria is also regarded as an alterative, on account of its influence upon secretions, and may be used in syphilis, especially of the skin.

**SANTALI OLEUM** (U. S. P.).—**Oil of Santal, Oil of Sandalwood.**

**Dose,** ♏v–x; in emulsion or capsules.

**Pharmacology.**—A volatile oil distilled from the wood of Santalum album (Santalaceæ), of India. It is a pale-yellowish or yellow liquid, of a peculiar, strongly-aromatic odor, a pungent and spicy taste, and slightly-acid reaction. It is readily soluble in alcohol, ether, and chloroform, and is used in perfumery. Sandalwood-oil is not infrequently adulterated with some fixed vegetable or mineral oil, the essential oil of cedar or copaiba. The fixed oils may be detected by their lighter specific gravity and by the fact that if fixed oil be present it will not volatilize but will leave a permanent stain when placed upon a piece of unsized paper. The essential oils are most surely recognized by the polarimeter, as they diminish the rotatory power of the sandalwood-oil.

Another method for detecting adulteration is given by M. E. Mesnard. The addition of pure sulphuric acid to unadulterated oil produces a viscid liquid which soon thickens into a solid mass, of a light grayish-blue or grayish color, and adheres to the glass. If the oil is impure the resinous mass does not entirely solidify and remains of a deep tint with a distinct lustre.

**Physiological Action.**—Sandalwood-oil acts as an internal antiseptic and as an astringent to mucous surfaces, checking secretions and causing dryness of the throat and thirst. It is largely excreted by the kidneys and imparts an odor to the urine, to which it gives also medicinal qualities, so that it acts upon the urinary passages. Absorption and elimination are very rapid, and it may be detected in the urine half an hour after administration. This oil partly escapes by the broncho-pulmonary mucous membrane, and here also exerts a local effect. Dr. S. Rosenberg observed, after daily doses of 60 drops, irritation of the alimentary canal and urethra, with an eruption of small red papules upon the skin and conjunctiva.

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* Phillips, *op. cit.*

**Therapy.**—Sandalwood-oil is used principally in the treatment of gonorrhœa, even in the acute stage, given in capsules of 5 minims each, one or two, three times daily It seems to be best adapted to plethoric individuals, with abundant discharge. It generally relieves the pain and discharge within four or five days. If the discharge is not materially diminished within ten days the doses should be cautiously increased. The use of the oil is not contra-indicated by the presence of any of the complications of the disease. It is also valuable in pyelitis, cystitis, gleet, urethral hæmorrhage, and chronic bronchial catarrh. Dr. Curtin, of Philadelphia, recommends oil of sandalwood in the treatment of obstinate cough. He administers it with advantage in phthisis, catarrhal pneumonia and influenza, but finds that in pharyngeal and dyspeptic coughs and those dependent upon enlarged tonsils its action is more uncertain.

It is important to note that much of the oil of sandalwood, especially in the form of proprietary capsules, is impure, and is adulterated with other oils. The French preparation, known as Santal-Midy, prepared by Midy's process from freshly-felled Mysore sandalwood, is a reliable preparation, put up in capsules of 5 drops each in the laboratory of Rigaud and Chapoteaut, Paris. The leading manufacturers of soft capsules in this country, Messrs. Parke, Davis & Co., also employ an oil of good quality and therapeutical activity. The advantage of pure oil of sandalwood over copaiba and cubeb is that it does not nauseate or disturb digestion, and can be given with good results during the inflammatory stages of blennorrhœa or cystitis. The fluid extract, obtained from the S. citrinum, or yellow sandalwood, has been used for the same purposes as the oil. The wood is largely used as an ingredient of incense, in China, in temple-worship, and is prized for its perfume.

### SANTALUM RUBRUM (U. S. P.).—Red Saunders.

**Pharmacology.**—The wood of Pterocarpus santalinus (Leguminosæ) usually is met with in the shops as raspings. It contains a red coloring matter of a resinous character, known as **Santalic acid,** which is soluble in alcohol, but insoluble in water. It is used in pharmacy for coloring alcoholic liquors or tinctures red. It enters into the compound tincture of lavender.

### SANTONICA (U. S. P.).—Santonica, Levant or German Wormseed.

**Dose,** ʒss–j.

*Preparations.*

*Extractum Santonicæ.*—Extract of Santonica. *Dose,* gr. ii–viij.

*Extractum Santonicæ Fluidum.*—Fluid Extract of Santonica. *Dose,* ♏viii–xxx.

*Santoninum* (U. S. P.).—Santonin, Santoninic Acid. *Dose,* gr. i–iv.

*Sodii Santoninas.*—Sodium Santoninate. *Dose,* gr. v–x.

*Trochisci Sodii Santoninatis.*—Troches of Sodium Santoninate (each containing 1 grain of the soda salt). *Dose,* i–v.

*Trochisci Santonini* (U. S. P.).—Troches of Santonin, Worm Lozenges (each gr. ss). *Dose,* i–v.

**Pharmacology.**—The unexpanded flower-heads of Artemisia pauciflora (Compositæ), growing in Turkestan and surrounding countries, are generally known as wormseed. They contain about 1 per cent. of volatile oil and from $\frac{1}{2}$ to 2 per cent. of **Santonin,** a peculiar crystalline principle, with faintly-acid properties, forming salts with alkalies, of which the sodium salt was formerly official. As the object of administration of this remedy is to act locally upon the parasites of the digestive tract, it is better to employ the slightly-soluble santonin than its more soluble combination. The troches, therefore, made with santonin, instead of sodium santoninate, are better, because less likely to occasion toxic effects. Santonin dissolves with difficulty in cold water. It is soluble in 250 parts of boiling water, readily soluble in alcohol, chloroform, and alkaline solutions, moderately soluble in ether and insoluble or nearly so in glycerin.

**Physiological Action and Therapy.**—Santonin is a very popular vermifuge against the round-worm, **Ascaris lumbricoides,** and, to a less extent, against the thread-worm, **Oxyuris vermicularis.** It has no effect upon the tape-worm. The crystals of santonin and its official salt are colorless, but turn yellow upon exposure to light. This effect is due to a partial change in its composition. Colored santonin is an unreliable remedy. When taken into the body, the same change occurs in the blood, which disturbs the nutrition of the cerebral centres, so that chromatopsia is produced, the patient complaining that everything has a lurid, yellow, or greenish tinge, and he may even entirely lose his vision for a few days. In exceptional instances the color perceived was red or blue.

The urine is stained a greenish-yellow, or, if it should be alkaline, it has a reddish-purple color. This is due to **xanthopsin,** a derivative of santonin. As a similar color is produced by chrysarobin it may sometimes be desirable to distinguish these two substances by proper tests. This can be readily done, according to Hoppe-Seyler, by adding caustic soda to the urine and shaking it up with amylic alcohol. The urine loses its color if santonin be present, but if the tint is caused by chrysarobin the alcohol has little effect upon the color.

Elimination, which takes place by the kidneys, is slow, about two days being required for the removal of an ordinary dose. The flow of urine is considerably increased, and the calls for micturition are frequent. Acute poisoning sometimes occasioned by children eating worm-candy, or lozenges, is manifested by cerebral and digestive disorder and muscular prostration, with tremors, or even convulsions. Death occurs from respiratory failure. Urticaria has been caused by its prolonged administration. A case of urticaria has been reported as due to a single 3-grain dose given to a child. In the case of a man, 5 grains caused, within three hours, "a general morbilloid eruption and an intense punctiform rash on the mucous membrane of the mouth and throat."* It should be given cautiously to feeble children, and be followed in a few hours by a dose of magnesia or rhubarb. Some practitioners prefer to administer santonin with castor-oil, and, in the experience of Dr. Whitla, this combination is of decided value in diminishing the danger of any ill effects. In aggravated cases Professor Demme was accustomed to administer santonin in castor-oil, but, as a rule, he preferred to give it in a slightly sweetened oleaginous solution, ½ grain to 1 ounce of olive-oil, believing it to be more efficacious in this form than in that of powder.

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* *The National Dispensatory,* fifth edition, p. 1415.

The treatment of poisoning is by diffusible stimulants, a hot bath, demulcent drinks, belladonna, and strychnine, with ether to control convulsions.

In case children show symptoms of intestinal irritation, suggesting the presence of worms, their passage should be watched in order to detect the presence of parasites, and this may be assisted by a saline purgative, such as magnesia, or rhubarb and magnesia, which removes the mucus in which worms breed. Then a dose of santonin should be given at night and followed by a purgative in the morning.

| | |
|---|---|
| ℞ Santonini, | gr. iij. |
| Hydrarg. chloridi mitis, | gr. vj. |
| Sodii bicarb., | gr. xij. |
| M. et div. in chart. no. vj. | |
| Sig.: Give one each night to a child 6 years old. | |

Rex* gives the following prescription, containing santonin, for lumbricoid worms:—

| | |
|---|---|
| ℞ Santonini, | gr. viij. |
| Ext. spigeliæ et sennæ fluid., | f℥j. |
| M. Sig. One teaspoonful three times a day. | |

In color-blindness, santonin has been tried with asserted success, but is probably of no service in the congenital form, though it might be serviceable where vision has been impaired or the appreciation of color lost by accident or disease. It has been advocated as a remedy for some disorders of the optic nerve, but without clinical evidence to support the suggestion. Nocturnal enuresis occasionally yields to santonin after the failure of other remedies. By Mr. Whitehead, of Manchester, santonin is recommended in amenorrhœa, especially when that condition is dependent upon chloro-anæmia. He gives a 10-grain dose on two successive nights. Dr. Cadogan Masterman reported a case in which this method of treatment was serviceable in severe uterine colic arising from suppression of the menses. The administration of the remedy was soon followed by the occurrence of the catamenia and relief of pain.

**Santoninoxime** (obtained by heating 5 parts of santonin with 4 parts of hydroxylamine hydrochlorate and 3 or 4 parts of lime in the presence of alcohol) is in the form of white, silky, needle-shaped crystals, insoluble in cold water, slightly soluble in boiling water, soluble in alcohol and acetic acid; it has been brought out recently as a substitute for santonin. It is claimed that this substance may be administered in doses two or three times as large as santonin, and without producing ill effects.†

**SAPO** (U. S. P.).—**Soap.** Soap prepared from soda and olive-oil.

**SAPO MOLLIS** (U. S. P.).—**Soft Soap.** Soap prepared from potassa and fixed oils.

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* *The College and Clinical Record*, February, 1891.

† *Répertoire de Pharmacie*, 1890; *Journal de Méd. de Paris*, November 16, 1890.

### *Preparations.*

*Enplastrum Saponis* (U. S. P.)—Soap Plaster (soap 10, lead plaster 90 parts).

*Linimentum Saponis* (U. S. P.).—Soap Liniment (soap 7, camphor 4.5, oil of rosemary 1, alcohol 75, water q. s. ad 100 parts).

*Linimentum Saponis Mollis* (U. S. P.).—Liniment of Soft Soap* (green soap 65, oil of lavender 2, alcohol and water q. s. ad 100 parts). For external use.

*Tinctura Saponis Viridis Composita* (N. F.).—Compound Tincture of Green Soap (contains green soap, 15 per cent.; oil of cade, 2 per cent.). For external use.

**Pharmacology.**—Soap may be either hard or soft. The combination of soda and fatty acids makes a hard soap; potassa makes a soft or jelly-like soap. The latter is official as soft, formerly green soap, although it is generally brownish-yellow rather than green. The sapo mollis, or soft soap, of the British Pharmacopœia, is made with olive-oil with an excess of potassa. Even hard soap usually retains considerable water when cut into bars, and, as this afterward evaporates, the soap shrinks, becomes wrinkled, and increases in hardness so that it may be powdered. Old Castile soap is a good excipient for pills, especially cathartic masses, and enters into compound extract of colocynth, pills of asafœtida, of aloes and asafœtida, of opium, and of rhubarb. Nearly all soaps are palmitates or oleates of sodium or potassium, or a combination of them. These fatty acids may also combine with other bases, as in the lead-soap, **emplastrum plumbi,** and lime-soap **linimentum calcis.** Soap also enters into chloroform liniment.

**Physiological Action.**—Soap is a useful detergent, removing fat from the skin, together with dirt, foreign matter, bacteria, and epithelial scales. In antiseptic surgery the field of operation is usually first washed with soap and water and afterward with disinfectants. Taken internally, soap is a laxative and is an antidote to acid and corrosive poisoning. In the form of soap plaster, it is a good protective for the prevention of bed-sores. Applied to raw surfaces, soap augments secretions and keeps up discharge; soap and brown sugar form a stimulating dressing. Soap acts as an alkali internally and affords relief in cystitis, and was formerly vaunted as a specific for stone in the bladder, but it has been proven that this claim was not well founded. Suppositories made with soap and glycerin are very convenient for the purpose of unloading the rectum, and small suppositories of soap will relieve infantile constipation. In the treatment of diseases of the skin, the author has witnessed signal benefit from the judicious employment of medicated hard soap. It is prudent to begin its use upon a small area, and, if it prove beneficial, it can afterward be applied to the whole of the affected area. In some instances medicated soap can be profitably used every day; in others, two or three times a week, or even less frequently. Numerous active drugs have been incorporated in soda-soap.† Among these may be enumerated boro-glyceride, carbolic acid, eucalyptol, naphthol, salicylic acid, corrosive sublimate, tar, etc. Most medicated soaps are made of 10-per cent. strength. Some of the more active substances, as carbolic acid, eucalyptol, salicylic acid, are usually but half this strength, while 1 per cent. of corrosive sublimate is a sufficient proportion. Dr. P. J. Eichhoff has recently recommended the use of pulverulent soaps on account of the ease with which medicinal substances can be incorporated. A neutral soap is made by boiling together soda solution and beef suet and has been placed upon the market as a fine, anhydrous though hygroscopic powder, which forms the basis of all the soaps and is known as neutral soap-powder base. A superfatted base is obtained by the addition of 2 per cent. of oleic acid and 3 per cent. of lanolin. By the addition of 2.5 per cent. each of potassium and sodium carbonates an alkaline soap-powder is prepared. Any one of these bases may then be medicated by the incorporation of various medicinal substances. Green soap is more decidedly alkaline, and exerts a softening effect on the tissues, on account of the excess of potassa which it contains. Its preparations are not used internally.

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* Also known as Spiritus Saponis Kalinus of Hebra.

† For a list of medicated soaps, with a description of their composition and indications, see author's treatise on "Diseases of the Skin," second edition, p. 859.

**Therapy.**—Powdered soap is an ingredient in some kinds of dentifrices and undoubtedly helps to preserve the teeth. As an ingredient in cathartic pills, it prevents griping and is useful in ordinary constipation:—

| | |
|---|---|
| ℞ Res. podophylli, | gr. ij. |
| Ext. belladonnæ folior. alc., | gr. j. |
| Saponis, | gr. xxx. |
| Ol. cajuputi, | ♏iv. |

M. et div. in pil. no. xij.
Sig.: Take one or two at bed-time, as a laxative.

Soap-suds, made by rubbing soap in hot water, form a convenient enema for unloading the bowels; a couple of pints or more may be used, to which some castor-oil or oil of turpentine may be added. Green soap is useful in chronic induration of the skin, especially in the form of the official liniment, which is Hebra's spiritus saponis kalinus, and may be diluted with Cologne water (1 to 3). It is useful as a cleansing agent for the scalp in seborrhœa. In sprains, rheumatic stiffness and pains, the liniment is very useful, and may have anodynes, like aconite, chloroform, or laudanum added to it:—

| | |
|---|---|
| ℞ Chloral. hydrat., | ʒij. |
| Lin. saponis, | f℥v. |

M. Sig.: Use with friction in rheumatic pains.

Soft soap is used in chronic eczema, the best form being the official liniment, which is well rubbed into the affected area and followed by a soothing application. In psoriasis, if there be much itching, we may use the following:—

| | |
|---|---|
| ℞ Saponis viridis, | |
| Olei cadini, | |
| Alcoholis, | āā f℥j. |

M. Sig.: Rub, every day or two, firmly into the patches, previously denuded of scales.

Liveing recommends the following:—

| | |
|---|---|
| ℞ Saponis viridis, | f℥j. |
| Alcoholis, | f℥iss. |
| Aquæ. | f℥iii–vj. |
| Solve cola et adde | |
| Ol. lavandulæ florum, | ♏xx. |

M. Sig.: To be rubbed in at suitable intervals and allowed to dry on, preferably at night, in chronic psoriasis, acne, tinea, and sometimes lupus.*

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* Materia Medica and Therapeutics, p. 442. Phillips, 1886.

Kappesser, Senator, and others have found soft soap a useful application to enlarged glands, whether of simple inflammatory, scrofulous, or syphilitic origin. Other scrofulous or tuberculous manifestations, as disease of the mesenteric glands, periostitis, or caries, have been benefited by the same topical treatment. The same remark may be made concerning exudations into serous cavities.

A caution should be given with regard to the use of soap upon delicate skins, especially in infants. Most toilet-soaps are too alkaline, and may contain irritating essential oils. Moreover, many cheap soaps are made with animal fat which has not been properly purified, and therefore they contain the bacteria of putrefaction and perhaps of disease. That vegetable-oil soap is preferable is acknowledged by the pharmacopœia, which requires it to be made with olive-oil. This is also called Castile soap, which may be either white or colored, the former being preferred. A good cottonseed-oil soap for the toilet or household is made by the Cotton Seed Oil Product Company. A pure glycerin soap is probably the best for the skin, it having been made transparent by dissolving it in alcohol, which is afterward driven off by heat.

**SAPONARIA.—Soapwort-Root.**

**Dose,** ʒss–iss, in infusion, several times daily.

**Pharmacology and Physiological Action.**—The root of Saponaria officinalis (Caryophyllaceæ), of Europe and America, contains **Saponin,** resin, and other vegetable principles. It resembles senega, sarsaparilla, quillaia, and other drugs containing saponin, in making a soapy emulsion with water, and as an expectorant, but is not used in medicine at present. In the arts, it is largely employed for washing silk, etc.

**Therapy.**—The smaller roots are to be preferred for making the infusion, which may be used in chronic cutaneous diseases, rheumatism, gout, and bronchial catarrh. About an ounce and a half of the drug may be employed in this way in the course of twenty-four hours.

**SAPONINUM.—Saponin.**

**Pharmacology.**—Saponin is a vegetable, active principle, a glucoside, found in caulophyllum, quillaia, saponaria, senega, and other plants. In watery solution it acts like soap, making a froth when the solution is shaken up, and forming emulsions.

**Physiological Action.**—Saponin is a local irritant; also an anæsthetic and muscular poison. It causes pain when injected hypodermically, and excites the air-passages and causes sneezing if applied to the nose. Locally applied, it paralyzes both sensory and motor nerves, producing local paralysis with anæsthesia and stiffness of the muscles. It counteracts the effects of digitalis upon the heart. Saponin also paralyzes the respiratory and vaso-motor centres, and after large doses respiration fails before the heart ceases to beat. If injected into a vein, death follows from cardiac paralysis.

**Therapy.**—In aortic disease with hypertrophy, Brunton suggests the employment of quillaia for the saponin which it contains. Saponin may also be used, in small doses, as an expectorant in chronic bronchitis. Senegin, which is probably identical, has been administered in 2-grain doses to check uterine hæmorrhage. Saponin might be useful in snake-bite, and in other affections for which senega has been recommended, as snake-root is thought to owe its activity to this active principle.

### SARSAPARILLA (U. S. P.).—Sarsaparilla.

*Preparations.*

*Extractum Sarsaparillæ Fluidum* (U. S. P.).— Fluid Extract of Sarsaparilla. *Dose*, f ʒ ss–ij.

*Extractum Sarsaparillæ Fluidum Compositum* (U. S. P.).—Compound Fluid Extract of Sarsaparilla (sarsaparillæ 75, glycyrrhiza 12, sassafras-bark 10, mezereum 3, glycerin 10, alcohol and water, of each q. s. ad 100 parts). *Dose*, f ʒ ss–j.

*Decoctum Sarsaparillæ Compositum* (U. S. P.).—Compound Decoction of Sarsaparilla (sarsaparilla 10, sassafras, guaiac-wood, and liquorice-root, of each 2, mezereon 1, water q. s. ad 100 parts). *Dose*, f ℥ i–iv.

*Syrupus Sarsaparillæ Compositus* (U. S. P.).—Compound Syrup of Sarsaparilla. *Dose*, f ʒ ss– ℥ ss.

*Extractum Sarsaparillæ.*—Extract of Sarsaparilla (made from fluid extract by evaporation). *Dose*, gr. v–xxx.

**Pharmacology.**—The roots of Smilax officinalis, S. medica, and of other undetermined species of Smilax (Liliaceæ) are official in the U S. P. under the general title of sarsaparilla. They are brought here from Mexico, Central America, and Brazil, chiefly, the roots varying in value and appearance. Smilax officialis, or so-called Jamaica sarsaparilla is the only one recognized by the British Pharmacopœia. The roots are small, about ½ inch in diameter, 6 or 7 feet in length; they are usually folded up into bundles about 26 inches long. They are inodorous; the taste is mucilaginous, bitter and acrid. The flavoring known as sarsaparilla at the soda-water fountain is made from oil of sassafras and gaultheria. An acrid, neutral principle, **Parillin** or **Smilacin** (closely resembling saponin) has been found combined with resin (2½ per cent.) and traces of volatile oil. In addition to this substance two glucosides are present, and it is principally to one of these that Professor Kobert attributes whatever activity sarsaparilla possesses.

**Physiological Action.**—The experiments undertaken to determine the physiological effects of sarsaparilla have yielded negative results, and deductions from the therapeutical effects are not available because it is always given with other drugs, classed by Brunton among stimulant diuretics and alteratives. It is probably inert, or nearly so, in the doses usually given, though moderate doses sometimes seem capable of improving the appetite and digestion. In much larger doses it would, probably, give the physiological effects of smilacin (saponin?). The chief value of the preparations of sarsaparilla is that they are pleasant vehicles for disguising the taste of potassium iodide and of mercury, with which they are usually prescribed for syphilis :—

℞ Potassii iodidi, . . . . . . . . . . ℥ ss.
Syr. sarsaparillæ co.,
Aquæ destillatæ, . . . . . . . . . . āā f ℥ iij.

M. Sig.: A dessertspoonful in a glass of water two hours after meals in syphilitic skin affections.

Or, in the tertiary form of syphilis, we may give the recent decoction, which if drunk hot, causes diaphoresis and diuresis, thus greatly increasing the alterative effects. There is no evidence of a curative action of sarsaparilla by itself in syphilis; nevertheless, in debilitated subjects in whom mercury has, for a time, lost its beneficial action, or become positively harmful, a temporary recourse to sarsaparilla has been considered useful by excellent observers. Phillips believes that this remedy is serviceable in chronic pulmonary affections, where there is much wasting; in chronic rheumatism and cutaneous disorders, in which there may be suspected a venereal taint, sarsaparilla is useful. Sir Astley Cooper considered it serviceable in cachectic conditions of the system, caused by long-continued suppuration; also, in chronic abscesses, old ulcers and bone disease. In Germany, a compound decoction containing alum, kino, calomel, senna and aromatics (Zittman's decoction) is used in syphilis, chronic rheumatism, and in scrofulous disorders. Sir Erasmus Wilson declared that in certain obstinate syphilitic ulcers, especially upon the mucous membrane of the tongue or mouth, he had obtained decided benefit from the administration of Zittmann's decoction after failure with mercury and iodine. Zittmann's decoction is prepared in two forms, a milder and a stronger.

Dr. Clark, of Youngstown, Ohio, has found the following combination useful in debilitated conditions of the system:—

℞ Syr. sarsaparill. co., . . . . . . . . . f℥ij.
Extr. lappæ fl., . . . . . . . . . f℥j.
Extr. taraxac. fl., . . . . . . . . . f℥j.
Syr. acidi hydriodici, . . . . . . . . . f℥iv.
M. Sig.: Teaspoonful in water three times a day.

## **SASSAFRAS** (U. S. P.).—**Sassafras-Root Bark.**

### *Preparations.*

*Sassafras Medulla* (U. S. P.).—Sassafras-Pith.

*Mucilago Sassafras Medullæ* (U. S. P.).—Mucilage of Sassafras-Pith (2 parts in water 100).

*Oleum Sassafras* (U. S. P.).—Oil of Sassafras. *Dose*, ♏i–iv.

*Infusum Sassafras.*—Infusion of Sassafras (℥j to Oj). *Dose*, fʒii–viij.

**Pharmacology.**—Sassafras is the bark of the root of Sassafras variifolium (Laurineæ), common in the United States from Canada to Florida. The principal constituent of the bark is the volatile oil; it also contains tannic acid, resin, etc. The oil of sassafras is of a light-yellow color, and is a mixture of two oils, one lighter, the other heavier, than water. Sassafras also contains a peculiar principle, termed **Sassafrin.** The pith of the branches contains mucilage, which is used in pharmacy as a vehicle or diluent.

**Physiological Action.**—The oil is stimulant and rubefacient, and, taken internally, is a carminative. It is largely used as a flavoring agent in confectionery as well as pharmacy. In the experience of Dr. John Bartlett the oil of sassafras is capable of exciting uterine contractions and causing abortion. It has been known to occasion narcotic poisoning.

**Therapy.**—Sassafras is an aromatic stimulant, and small bundles of the fresh bark are sold by herb-gatherers to be chewed for its flavor and as a carminative. A recent infusion is used in some parts of the country as a blood-purifier; or, taken hot, as an emmenagogue and diaphoretic.

Sassafras is generally given in combination with guaiac and sarsaparilla, and in those cases where the latter agents are considered indicated. The mucilage of sassafras-pith may be used as a demulcent drink in inflammation of the stomach or bowels, especially when this has been excited by irritant or corrosive substances. It is a cooling application to inflamed eyes or erysipelas, and may be used as a vehicle for other remedies. The following is known as Jackson's Pectoral Syrup:—

| | |
|---|---|
| ℞ Medullæ sassafras, | ʒss. |
| Acaciæ, | ʒv. |
| Aquæ, | f℥viss. |
| Allow this to stand for twelve hours, stirring occasionally, then add | |
| Sacchari, | ℥x. |
| Dissolve without the aid of heat, strain, and add | |
| Morphinæ hydrochloratis, | gr. iij. |

M. Sig.: Dose, one to two teaspoonfuls several times daily (each drachm contains about gr. $\frac{1}{25}$ morphine).

Another formula for this syrup is given by Remington:—

| | |
|---|---|
| ℞ Ol. sassafras, | ♏lxiv. |
| Tinct. tolutani, | f℥viij. |
| Magnesii carb., | ℥ij. |
| Aquæ, | Oviij. |
| Sacchari, | lbs. xiv (avoir.). |
| Morphinæ hydrochloratis, | gr. lxiv. |

M. Rub up the tincture and oil with the carbonate, gradually add $\frac{1}{4}$ pound of the sugar and then the water, filter and recover 8 pints, in which dissolve the remainder of the sugar. Dissolve the morphine in one fluidounce of water, add to the syrup, and make the measure up to 16 pints.

Sig.: Take a teaspoonful or more several times daily for cough (each drachm contains $\frac{1}{32}$ grain of morphine hydrochlorate).

The **Atherosperma moschata,** or Australian sassafras, a tree of Southern Australia and Tasmania, contains an alkaloid called atherospermine and a volatile oil, of a light yellow color and a pleasant smell and taste, recalling that of sassafras. A decoction of the bark acts freely upon the kidneys and skin and has been used in rheumatism, secondary syphilis and acute bronchitis. It liquefies sputum and facilitates expectoration. The physiological effects of the oil have been studied by Dr. Ralph Stockman, who found that in frogs and mammals it acted upon the central nervous system, producing at first excitement and subsequently marked depression. Respiration is retarded, and after fatal doses the heart stops in diastole. The oil possesses antiseptic properties.

### SCAMMONIUM (U. S. P.).—Scammony.

**Dose,** gr. v–xv.

*Preparations.*

*Resina Scammonii* (U. S. P.).—Resin of Scammony. *Dose,* gr. iv–viij.

*Extractum Colocynthidis Compositum* (U. S. P.).—Compound Extract of Colocynth (resin of scammony 14, aloes 50, colocynth 16, cardamom 6, soap 14 parts). *Dose,* gr. ii–x.

It is also an ingredient in the compound cathartic pill.

**Pharmacology.**—Scammony is a resinous exudation from Convolvulus scammonia (Convolvulaceæ). It contains about 80 per cent. of a resin, soluble in alcohol and ether (which is official), and gum, starch, etc. **Scammonin** (Jalapin), is the active principle. Scammony has a slightly acrid taste and a peculiar odor, which recalls that of cheese. Scammonin is a glucoside, nearly insoluble in water, soluble in alcohol, chloroform, ether, and alkaline solutions.

**Physiological Action.**—This drug is a hydragogue cathartic, and feebly cholagogue; in large doses it causes symptoms of irritant poisoning. Absorption depends upon its intimate mixture with the alkaline bile and intestinal fluids, and for this reason the action of scammony is liable to vary in rapidity and power. Its effects are usually manifested in about four hours.

**Therapy.**—In children, where active purgation is required, calomel and scammony may be given, triturated with sugar of milk. In cerebral affections and dropsies, scammony is useful, especially in the form of compound extract of colocynth. It clears mucus from the intestines, and is an anthelmintic against both round worms and tapeworms. Scammony is serviceable in obstinate constipation and impaction of fæces. It is a purgative well adapted to cases of mania and hypochondriasis.

**SCILLA** (U. S. P.).—**Squill.**
**Dose**, gr. ii–iij.

*Preparations.*

*Extractum Scillæ Fluidum* (U. S. P.).—Fluid Extract of Squill. *Dose*, ♏i–v.
*Acetum Scillæ* (U. S. P.).—Vinegar of Squill (10 per cent.). *Dose*, ♏v–fʒj.
*Tinctura Scillæ* (U. S. P.).—Tincture of Squill (15 per cent.). *Dose*, ♏v–xxx.
*Syrupus Scillæ* (U. S. P.).—Syrup of Squill (vinegar of squill with sugar). *Dose*, ♏x–fʒj.
*Syrupus Scillæ Compositus* (U. S. P.).—Compound Syrup of Squill (squill, senega and tartar emetic). *Dose*, ♏x–fʒj.
*Oxymel Scillæ.*—Oxymel of Squill (equal parts honey and vinegar of squill). *Dose*, ♏xx–fʒij.

**Pharmacology.**—The sliced and dried bulb of Urginea maritima (Liliaceæ), coming from the Mediterranean. The white squill is the best. It readily absorbs moisture and deteriorates; it should be kept in a dry place. The active principles are **Scillipicrin, Scillitoxin,** and **Scillin**; sculein and scillitin are probably impure scillitoxin, which is the most active of the three.

**Physiological Action.**—In large doses squill is emetic and purgative; in smaller quantities, diuretic and expectorant. In excessive quantity it gives rise to severe or even fatal gastro-enteritis. In overdoses squill is highly irritant to the kidneys, causes a diminished flow of urine, which may contain blood, or it may even suppress the secretion. Husemann states that death has been produced by the ingestion of 24 grains. In cases of poisoning the treatment is that appropriate to gastro-enteritis. Brunton classes scillitoxin among the cardiac tonics, as medicinal doses slow the heart and raise the arterial tension, like digitalis. When applied to the skin it is absorbed, and produces systemic effects. Elimination takes place by the bowels, kidneys, and bronchial mucous membrane. Squill has a bitter taste and feeble smell.

**Therapy.**—Squill is not used by itself as an emetic, although the compound syrup, containing antimony and potassium tartrate, is sometimes used for this purpose in young children suffering with bronchitis or croup; but it is too depressing for ordinary cases. In weak heart, associated with dropsy or bronchial disorder, squill is especially useful, the vinegar of squill being a good preparation. Its diuretic action is enhanced by combination with calomel and digitalis. In ordinary catarrhal bronchitis, squill is useful after the first stage has passed, and the secretions are becoming more tenacious. As the syrup contains acetic acid, it should not be prescribed with ammonium carbonate. In whooping-cough it is very serviceable. It should not be given in acute renal disease on account of causing irritation of the kidneys. This remedy has been used with advantage in cases of chronic pleurisy and pericarditis with effusion, and in cardiac dropsy.

### SCOPARIUS (U. S. P.).—Broom.

### SCOPARIUS SUMMITATES.—Broom Tops.

**Dose,** ʒj, in infusion.

*Preparations.*

*Extractum Scoparii Fluidum* (U. S. P.).—Fluid Extract of Scoparius. *Dose,* fʒss–j.

*Sparteinæ Sulphas* (U. S. P.).—Sparteine Sulphate. *Dose,* gr. ss–ij.

**Pharmacology.**—The tops of Cytisus scoparius (Leguminosæ), of Europe, contain **Scoparin,** which is a crystallizable neutral principle, and **Sparteine,** a volatile liquid alkaloid. An infusion or decoction is frequently used (ʒj–Oj), a pint or more in divided doses being taken during the day. A fluid extract is official, as well as **sparteine sulphate,** which is given in doses of gr. $\frac{1}{24}$ to $\frac{1}{2}$ hypodermically, and gr. $\frac{1}{2}$–ij, or more, by the mouth.

Sparteine sulphate is a crystalline powder readily soluble in water and alcohol, its solutions having a bitter taste.

**Physiological Action.**—No local action. Internally, broom, in large doses, excites vomiting and purging, and in smaller doses causes marked increase of urinary flow. It is asserted that scoparine is the agent which acts upon the kidneys, and that sparteine acts upon the heart as a stimulant or tonic, like scillitoxin or digitalin. Sparteine has also a decided effect upon the nerves and spinal cord, lowering reflex action, paralyzing motor nerves, reducing the electrical excitability of the vagus, and finally causing death by respiratory paralysis, both as the result of its action upon the centre and upon the muscles of respiration. The action upon the heart, due both to a nervous and a muscular stimulation, is manifested soon after its administration; the pulse becomes slower at first, and, in about an hour, arterial tension is raised, and the effects last five or six hours. When taken regularly for a few weeks, the effects continue for several days after the remedy has been stopped.

According to the experiments of Gluzinski, the effects of sparteine are much more marked upon cold-blooded animals than mammals, and are more striking in the former when the drug is applied directly to the heart than when injected subcutaneously or into a vein.* Clarke found no evil results following the administration of gr. $\frac{1}{16}$ every four hours, or as much as gr. xij in twenty-four hours, nor was there any evidence of cumulative action when it had been given for several months. Sparteine is a true diuretic, increasing both the urea and the water of the urine, being more rapid in its actions, but weaker than digitalis.

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* *Wien. Med. Blätter,* December 26, 1889; *The Medical Bulletin,* March, 1890, p. 91.

A series of experiments by Dr. David Cerna, relative to the physiological action of sparteine demonstrates that it causes a brief period of increased muscular irritability, that it augments reflex action by a direct influence upon the spinal cord, this increase being subsequently followed by a depression, that it causes convulsions of a spinal origin and generally of a tetanic nature, that it gives rise to a primary increase in the rate and force of the heart's action, by a direct influence upon the heart, the increase being soon followed by a decrease, due to a direct cardiac action and stimulation of the cardio-inhibitory centres; it augments blood-pressure by an action on the heart and also by stimulating the central vaso-motor system; subsequently the arterial pressure declines, owing to paralysis of the vaso-motor apparatus and a depressant influence upon the heart; it exerts a direct action upon the respiratory centres; it generally proves fatal by respiratory failure.

Germain Sée asserts that sparteine strongly and promptly reduces the size of the heart. Sparteine has no cumulative action.

**Therapy.**—In renal inadequacy or deficiency of urine, owing to insufficient arterial tension, scoparius is an excellent remedy; also in the œdema, or dropsy, accompanying heart-lesions. This remedy should not be given during the progress of inflammation of the lungs, heart, or kidneys, but in chronic parenchymatous nephritis broom may be used with advantage. In hydrothorax and ascites, the use of broom, in conjunction with occasional doses of compound jalap powder, is very successful:—

| | | |
|---|---|---|
| ℞ Potassii acetatis, | . . . . . . . . . | ʒ iss. |
| Aceti scillæ, | . . . . . . . . . . | f ʒ iv. |
| Infus. scoparii, | . . . . . . . q. s. ad | f ℥ viij. |

M. Sig.: Take a tablespoonful every four hours, as a diuretic.

Scoparin has also been used as a diuretic in doses of 8 to 15 grains by the mouth, or $\frac{1}{2}$ to 1 grain by hypodermic injection.

Sparteine sulphate is used by Germain Sée, in weak and irregular action of the heart, in doses of gr. $\frac{1}{4}$—$\frac{1}{6}$ every four hours. It gives the best results in heart-failure, the result of mitral disease. In irregular action of the heart this has been found specially serviceable. In cases of valvular disease, with defective compensation, Gluzinski states that small doses of sparteine sulphate ($\frac{1}{3}$ to $\frac{2}{3}$ grain) are more efficacious than larger quantities.

The author has found sparteine of service in cases of enfeebled cardiac action from structural lesions and also where the innervation of the organ was markedly disturbed. It is particularly valuable in disease of the mitral valve. In advanced stages of this affection, when dilatation has begun, marked relief follows the exhibition of sparteine. In cases of dyspnœa, palpitation and cardiac debility arising from an excessive deposit of fat around the heart, sparteine is a valuable remedy. In dilatation resulting from valvular disease the writer has often administered the remedy by hypodermic injection. It is likewise beneficial in functional disease of the heart caused by excessive bodily or mental labor, anxiety, etc. It has also proved useful in the treatment of tobacco heart. As sparteine increases the elimination of urea it is beneficial in chronic parenchymatous nephritis and in preventing the development of uræmia. Its administration may be maintained for a considerable period without causing disorder of the digestive functions.

In exophthalmic goitre (Graves's disease), it is claimed to relieve all the symptoms; and, given at the onset of a paroxysm of asthma (of cardiac origin?), it promptly checks it. Dr. William Evans, of this city, has published the history of a case in which the exhibition of sparteine was of decided benefit in angina pectoris. Dr. Cerna has given the drug with advantage in valvular lesions of the heart due to acute articular rheumatism, cardiac dilatation with failure of compensation, chorea associated with endocarditis, exophthalmic goitre, etc. Dr. Pawinski, of Warsaw, obtained good results from the use of sparteine in cardiac disease complicated with nervous disorders and in functional affections. M. Ball and Dr. Oscar Jennings have found the hypodermic injection of $\frac{1}{6}$ to $\frac{1}{3}$ grain of sparteine sulphate of value in supporting the heart and system in the sudden or gradual withdrawal of morphine from those addicted to use of the narcotic. Langlois and Maurange recommend the hypodermic injection of $\frac{1}{6}$ grain of morphine and from $\frac{1}{2}$ to $\frac{2}{3}$ grain of sparteine sulphate preliminary to the administration of chloroform. In a number of cases of tremors from various causes, Dr. Charles S. Potts, of Philadelphia, has found sparteine beneficial. In the pulmonary tuberculosis of young subjects, Dr. G. Maurange has witnessed a decrease of cardiac action and improvement of the general condition result from the hypodermic injection of the following solution:—

| | | |
|---|---|---|
| ℞ Spartein. sulphat., | | gr. iii–vj. |
| Eucalyptol. purificat., | | gr. iv. |
| Ol. olivæ sterilisat., | q. s. ad | fʒxxv. |
| M. | | |

The sparteine is first dissolved in a minimum of water and mixed with the oil. The water is then evaporated off and the oil retains from $\frac{1}{8}$ to $\frac{1}{4}$ grain of the alkaloid to a fluidrachm. Of this fluid he injects from $2\frac{1}{2}$ to 5 drachms every day for a month. Sparteine sulphate may be of service in allaying hysterical excitement.

A yellow precipitate is formed by a combination of sparteine sulphate and sodium iodide.

## **SCUTELLARIA** (U. S. P.).—**Skull-Cap.**

### *Preparation.*

*Extractum Scutellariæ Fluidum* (U. S. P.).—**Fluid Extract of Scutellaria.** *Dose,* fʒss–j.

**Pharmacology and Physiological Action.**—The herb of Scutellaria lateriflora (Labiatæ) has a bitter taste, and contains a little volatile oil and a bitter principle. The eclectic "**Scutellarin**" is an impure extract, probably devoid of medical qualities. It is given in doses of gr. ii–iv. The fluid extract is esteemed to possess tonic, antispasmodic, and alterative powers, but Dr. Lawrence Johnson states that if it possesses any valuable medicinal properties the fact remains to be demonstrated.

**Therapy.**—In various diseases, accompanied by twitching of the muscles, restlessness, tremors,—such as chorea, delirium tremens, epilepsy, etc.,—scutellaria has been employed, chiefly, however, in domestic practice. Its claims for usefulness in hysteria and hydrophobia are not well founded.

**SECALE CORNUTUM.—Spurred Rye.** (See Ergot.)

**SEDUM ACRE.—Stonecrop,** or **Wall-Pepper.**
**Dose,** ʒss–j.

*Preparation.*

*Extractum Sedi Acris Fluidum.*—Fluid Extract of Sedum Acre (made from the whole plant). *Dose,* ♏xv–xxx, gradually increased.

**Pharmacology.**—Sedum acre (Crassulaceæ), stonecrop or wall-pepper, is a small, moss-like, spreading plant, a native of Europe. It grows in dry fields and on old walls, with no smell, but has a mucilaginous and acrid taste.

**Physiological Action and Therapy.**—The juice of the stonecrop is a decided local irritant, and is capable of blistering the skin. Taken internally, in large doses, it acts as an acrid emetic and purgative. The bruised plant, or its juice, has been used with success upon indolent or unhealthy sores and enlarged lymphatic glands. The juice has been used to remove warts or corns. Dr. Louis Duval, of Madrid, asserts that sedum is of signal service in diphtheria, made into a decoction with beer. From 1 to 2 litres (1¾ to 3½ pints) of this decoction are given in hourly doses. When about four doses have been taken, free vomiting ensues, with removal of the false membranes. Injection of the decoction into the nares is said to be effective in nasal diphtheria. It is claimed that this drug possesses the power of loosening the diphtheritic membrane, and that it does not form anew. These statements have been confirmed by several physicians in other European countries, and by Dr. P. O. Wagener.* The latter writer cannot commend the decoction in beer, but obtains the same effects from the remedy used locally, and combined as follows:—

℞ Ol. terebinthinæ,
Acid. lactici,
Ext. aconiti fl., . . . . . . . . . . āā fʒij.
Ext. sedi acris fl., . . . . . . . . . . . f℥j.

M. This mixture is applied with a brush, every three minutes, for twenty minutes, when vomiting occurs and the membrane is expelled.

**SENEGA** (U. S. P.).—**Senega.**
**Dose,** gr. x–xx.

*Preparations.*

*Extractum Senegæ Fluidum* (U. S. P.).—Fluid Extract of Senega. *Dose,* ♏x–xx.

*Syrupus Senegæ* (U. S. P.).—Syrup of Senega (fluid extract 200, ammonia-water 5, sugar 700, water q. s. ad 1000). *Dose,* fʒi–ij.

The compound syrup of squill contains 8 per cent. of senega.

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* *Therapeutic Gazette,* 1885, p. 449.

**Pharmacology.**—The root of Polygala senega (Polygaleæ) is a knobby root-stock, with spreading, tortuous rootlets, twisted and keeled. It grows in the United States, especially in the South. The active principle, which is contained especially in the cortex, is **Senegin,** or **Polygalic acid,** and is apparently the same as saponin from saponaria, or quillaia-bark. It is a white powder, easily soluble in hot water and alcohol, forming a soapy emulsion when mixed with water, even in small quantities.

**Physiological Action.**—Senega is irritating to the air-passages and causes sneezing when inhaled. The root, when chewed, gives rise to a burning sensation. When swallowed in large doses, senega excites salivation and gastro-intestinal and renal irritation. It is likewise irritant when applied to the integument. It is a stimulating expectorant, diuretic, and diaphoretic. It does not liquefy the secretions of the bronchial tubes, but simply facilitates their expulsion. When the expectoration is tough and scanty, senega is of little use. It is usually given in combination with other expectorants and diuretics. Senega is excreted by the bronchial mucous membrane, skin, and kidneys, exercising upon these organs a stimulating action.

**Therapy.**—Senega is useful in the second stage of bronchitis, or pneumonia in the stage of resolution. In chronic bronchitis, associated with emphysema and occurring in aged people, it will often answer a good purpose. By some practitioners it is esteemed beneficial in croup. In bronchial asthma with emphysema, this remedy is likewise of considerable efficacy. Whooping-cough is sometimes ameliorated by the administration of senega. In dropsy, accompanying renal disease, it is useful. In palpitation, associated with aortic disease, and also in amenorrhœa, it has been found serviceable :—

℞ Ext. senegæ fl.,
Spts. chloroformi, . . . . . . . . . āā f ʒ i.
Syr. pruni Virg., . . . . . . . . q. s. ad ℥ ij.
M. Sig.: Take a dessertspoonful every two or three hours, for cough.

Senega is not to be used in heart disease on account of the depressing effects of its active principle. (See Saponin.) Senega has been administered, in doses of gr. ij. in uterine hæmorrhage. A decoction of senega-root, a pint being taken daily for a fortnight before the expected period, has been successfully employed in amenorrhœa. In chronic rheumatism, its diaphoretic and diuretic effects are useful.

## SENNA (U. S. P.).—Senna.

**Dose,** ʒi–iiss.

*Preparations.*

*Extractum Sennæ Fluidum* (U. S. P.).—Fluid Extract of Senna (made by percolation). *Dose,* ♏xxx–f ʒ iv.

*Syrupus Sennæ* (U. S. P.).—Syrup of Senna (contains senna, coriander, alcohol, and syrup). *Dose,* f ʒ i–iv.

*Infusum Sennæ Compositum* (U. S. P.).—Black Draught (senna, manna, Epsom salt, fennel, water). *Dose,* f ℥ i–iiss, every four hours until it operates.

*Confectio Sennæ* (U. S. P.).—Confection of Senna (cassia fistula, senna, coriander, tamarind, prune, fig, sugar, water). *Dose,* ʒ i–ij.

*Pulvis Glycyrrhizæ Compositus* (U. S. P.).—Compound Powder of Glycyrrhiza (senna, liquorice-root, fennel, washed sulphur, sugar). *Dose,* ʒ i–ij.

*Extractum Sennæ.*—Extract of Senna (fluid extract evaporated). *Dose,* ʒ i–iv.

*Extractum Sennæ Fluidum Deodoratum* (N. F.).—Deodorized Fluid Extract of Senna. (The leaves of senna are first washed with alcohol to extract the odorous and griping qualities of the drug, and are then used to prepare a fluid extract, as in the official preparation. This form is a pure, deodorized liquid senna of definite strength, and pleasant and certain in its effects). *Dose*, fʒ i–iv.

*Infusum Sennæ.*—Infusion of Senna (℥j–Oj). *Dose*, f℥ i–v.

Also enters into the compound syrup of sarsaparilla.

**Pharmacology.**—Senna is the pharmacopœial title for the leaflets of Cassia acutifolia (Alexandria Senna) and of Cassia angustifolia (India senna), plants of the natural order Leguminosæ, freed from stalks, discolored leaves and other admixtures. The principal constituent is **Cathartic acid**, a sulphurated glucoside, which exists in the drug in combination with earthy bases, such as calcium and magnesium, in salts which are soluble in water. **Sennacrol** and **Sennapicrin,** found in the drug, do not contribute to its physiological action, since they are insoluble in water. Senna also contains chrysophanic acid (Phillips). The activity of senna is destroyed by heat. In addition to the principles just named senna contains some odorous and other constituents, which impart to it a nauseating taste, but do not add to its therapeutic value, since they may be extracted with alcohol without impairing the effects.

**Physiological Action.**—Senna has a faint, disagreeable smell and a bitter, nauseous taste. Senna is an active, but not an acrid, cathartic. It generally acts in about four hours, producing copious, yellow stools; any tendency to griping may be avoided by using the deodorized fluid extract, or by combining aromatics with the other preparations. It is a hepatic stimulant of feeble power, rendering the bile more watery. Its use as a cathartic does not produce constipation. The menstrual flow may be excited by it, and if given to a nursing woman her milk may acquire purgative properties. Injected into the veins, it produces both vomiting and purging, and in overdoses it acts as a drastic cathartic, but is never poisonous in its effects. It is too irritant to the bowel to use in full doses where hæmorrhoids are present. When taking senna the urine sometimes has a red color. This hue appears when the fluid is of acid reaction, but when alkaline its normal yellow hue is deepened.

**Therapy.**—This drug is a safe, efficient, and, when combined with other drugs, a pleasant cathartic for constipation, or where simple unloading of the bowels is required. It should not be given where there is danger of abortion, or where inflammatory conditions of the intestine exist. It is a favorite laxative for pregnant women in the form of confection of senna and compound liquorice-powder, and the syrup is a good laxative for children. The infusion is useful to carry off worms from the intestinal canal. Black draught is an efficient but decidedly uninviting cathartic, and has nearly gone out of use, because its place has been taken by more pleasant remedies. Bartholow states that the addition of coffee masks the unpleasant taste of senna. The following formula for a cheap and efficient laxative is given by Mr. G. H. Dunn: One-half ounce of senna-leaves are placed in a quart of water and boiled fifteen minutes in a covered dish. The liquid is then strained and $\frac{1}{4}$ ounce of dry sugar added; $\frac{1}{2}$ pound each of figs and prunes are cut up, added to the liquid, and the whole is boiled until the fruits get thoroughly soft. Dose, one teaspoonful after each meal. A better method of making this would be to stew the fruit separately, and, after it has cooled, to add ½ ounce of the deodorized fluid extract, since the active principle, cathartic acid, is destroyed by heat. Laxative prunes may be made by adding syrup of senna or the fluid extract to the stewed fruit. The confection of senna made into a flattened bolus (ʒi–ij), and coated with sugar or chocolate, is sometimes known as fruit laxative, or "Tamar Indien," as it contains tamarind. They are readily eaten by children. Dr. Angel Bilbao has found that the administration of purgative doses of senna for a number of consecutive days diminished or arrested incontinence of urine present in the early stages of locomotor ataxia.

Cathartic acid has lately been employed as a purgative, and Dr. Kohlstock reports from the clinic of Professor Senator, of Berlin, favorable results from its action. It may be given by the mouth in the form of a powder rubbed up with sugar in the dose of ⅚ grain, to children from 2 to 4 years, and 2¼ grains to adults. Kohlstock administered it by the rectum, injecting 15 minims of the following solution:—

| | | |
|---|---|---|
| ℞ | Acid. cathartic. e senna, . . . . . . . | gr. xlv. |
| | Aq. destillat., . . . . . . . . . . | f ʒj¾. |
| | Sodii bicarbonat., . . . . . . . | q. s. ad react. alkalin. |
| M. | | |

**SERPENTARIA** (U. S. P.).—**Serpentaria, Virginia Snake Root. Dose**, gr. x–ʒj.

*Preparations.*

*Extractum Serpentariæ Fluidum* (U. S. P.).—Fld. Ext. of Serpentaria. *Dose*, ♏x–xxx.

*Tinctura Serpentariæ* (U. S. P.).—Tincture of Serpentaria (10 per cent.). *Dose*, f ʒ i–ij.

The compound tincture of cinchona contains 2 per cent. of serpentaria.

**Pharmacology**.—The rhizome and rootlets of Aristolochia serpentaria and of Aristolochia reticulata (Aristolochiaceæ), plants growing in the southern and western portions of the United States. The name snake-root, of itself, is not distinctive, and should not be used, because by this title several different plants are commonly called; for instance, Canada snake-root is Asarum Canadense, or wild ginger; black snake-root is Actæa racemosa, or cimicifuga; evergreen snake-root is Polygala paucifolia, or fringed polygala; while rattlesnake-root, or seneka snake-root, is Polygala senega, and Virginia snake-root is Aristolochia serpentaria. The last contains a bitter principle, **Aristolochin**, soluble in water and alcohol; also a **volatile oil** and some **resin**. The active principle is not used in medicine. All the preparations should be made from the fresh root, as it deteriorates by keeping.

**Physiological Action**.—Serpentaria is a tonic, a cardiac stimulant, and has some antiperiodic powers. It has a pungent, characteristic flavor, and small doses promote appetite and digestion, and are slightly exhilarating. Large doses cause considerable intestinal disturbance, flatulence, tenesmus, and frequent evacuations of semi-solid stools; they are also productive of nausea and vomiting, with much headache and dizziness. Hæmorrhoids are irritated and menstruation is stimulated. The drug is expectorant. Although asserted to possess aphrodisiac powers, it is doubtful if serpentaria has any direct influence of this kind; probably acting simply as a stimulant to the circulation and as a general tonic.

**Therapy.**—Though physiologically active, serpentaria is rarely used alone. In atonic dyspepsia it is a useful adjunct to cinchona in the compound tincture. It is also a good general tonic. Tablespoonful doses of a decoction of serpentaria are often able to allay bilious vomiting. The infusion is a useful wash for spongy gums, diphtheritic inflammation, or the sore throat of scarlatina. In pneumonia of a low type, serpentaria is useful in combination with the aromatic spirit of ammonia; and in bronchial catarrh it is a good expectorant. Its combination of expectorant and stimulant properties renders serpentaria useful, also, in capillary bronchitis. It has some reputation as a restorative in typhoid and typhus fevers, and in depressed conditions of the system generally. In chronic rheumatism it may be given in combination, with excellent results. In amenorrhœa dependent upon anæmia or chlorosis, serpentaria is said to have given good results. Serpentaria has been given with success in functional impotence.

**SESAMI OLEUM** (U. S. P.).—**Oil of Sesamum, Benné** or **Teel Oil.**

**Pharmacology.**—A fixed oil, similar to cottonseed oil, expressed from the seed of Sesamum Indicum (Pedaliaceæ). It is bland, inodorous, or nearly so, neutral in reaction, rich in olein, and is said to keep better than olive-oil. In large doses it is laxative, and emmenagogue properties have been attributed to it without much foundation. The seeds are used as food by the negroes of the South.

**SEVUM** (U. S. P.).—**Suet.**

**Pharmacology and Therapy.**—The internal fat of the abdomen of Ovis aries (class, Mammalia; order, Ruminantia), purified by melting and straining. If in well-closed vessels, it will keep for an indefinite time in a cool place, without turning rancid, which would spoil it for pharmaceutical purposes. It is a solid fat, with slight taste and very little odor, consisting chiefly of stearin. It is used to give greater consistency to ointments, and enters into the official ointment of mercury. For warm weather, a good ointment can be made as follows:—

| | |
|---|---|
| ℞ Hydrarg. chloridi mitis, . . . . . . . . | gr. xl. |
| Sodii benzoatis, . . . . . . . . . . | gr. x. |
| Sevi, . . . . . . . . . . . . . | ℥j. |
| Olei amygdalæ amaræ, . . . . . . . . . | ♏ij. |

M. Sig.: For eczema or intertrigo. Apply upon soft linen.

**SILICON.**—**Silica.**

*Preparation.*

*Liquor Sodii Silicatis* (U. S. P.).—Solution of Sodium Silicate, or Soluble Glass. For external use.

**Pharmacology and Therapy.**—Silicon is a non-metallic, elementary body, discovered by Berzelius in 1825. Its atomic weight is 28. It is obtained in two forms,—amorphous and crystalline. In nature, its compounds, with fluorine (silicon fluoride) and oxygen (silicic oxide), are widely diffused, and are known as fluor-spar and rock-crystal, or quartz, and, in a granular form, as sandstone or sand. Chalcedony, opal, and onyx, prized by the lapidary, are forms of the oxide. Crystallized quartz, or rock-crystal, is used for the manufacture of spectacle glasses and lenses. Window-glass is a mixture of potassium or sodium silicate with calcium silicate, and often contains aluminum silicate also. It is made by the prolonged fusion of potassium or sodium carbonate with pure quartz sand and lime. Flint glass contains lead, introduced in the form of red lead. Various colored glasses are made by adding metallic oxides to the above ingredients previous to fusion. **Hydrofluosilic acid** is a saturated aqueous solution of this acid, prepared by passing silicon fluoride (which is a colorless, suffocating gas, producing white fumes when allowed to escape into the air) through water. It is employed as a reagent in the laboratory.

The solution of sodium silicate is a clear, almost colorless, viscid fluid, odorless, with alkaline taste and reaction, and should not produce any irritant effects upon the skin. It dries in a short time, and has a smooth, glassy surface. In making dressings for fractures, successive layers of bandage are applied smoothly to the limb, rubbing the solution into each layer of bandage, until a sufficient thickness is obtained. The dressing is then allowed to dry, and a finishing coat is given with the brush, making a good permanent dressing. If desired, when applied to a limb, the apparatus may be slit up the back and front, and trimmed with scissors, so as to make two lateral moulded splints. Sodium silicate has also been used to take the place of the gypsum of the plaster jacket in the treatment of Pott's disease. The silicate apparatus is neat, light and can be perforated for ventilation.

A solution of **Potassium Silicate** is used in the same manner as the preceding, and, by some, a mixture of these two is considered preferable to either alone. It also has antiseptic qualities, and has been used as an injection, properly diluted, in gonorrhœa, vaginitis, and cystitis ; or applied as a dressing to erysipelas, with asserted good results.

The compound known as the sodium silico-fluoride has had a limited use as an antiseptic. Laplace reports that in the laboratory, as well as in the clinic-room, negative results have followed its employment as an antiseptic. Flagg, on the other hand, in dental practice, says that sodium silico-fluoride is both a disinfectant and antiseptic. It is used in the form of a salt or solution (5 to 8 per cent.) in water. It is, he adds, noteworthy as possessing the unusual and most desirable characteristics of being non-irritant, non-poisoning, neither discoloring nor staining, of decided rank as disinfectant and deodorizer, odorless, and of positively indefinite maintenance of integrity,—the solutions of three years' duration giving clinical evidence of being unchanged. The hydrated magnesium silicate has been utilized in France as a protective and absorbent in diarrhœa, in the same way that bismuth is ordinarily used, in doses of ʒi–ij. Friction with sand has been employed by Ellinger as a method of detaching the scales in psoriasis.

**SIMULO.—Simulo.**

**Dose,** ♏xx–fʒj, in fluid extract or as a tincture.

**Pharmacology.**—An herb of the Caper family, Capparis corriaceæ (Capparidaceæ), known as the simulo-plant, has had attention directed toward it by the investigations of Eulenberg* and others. No analysis has yet been made, and it is not known definitely whether or not it has any principle with positive therapeutic action. The kernel of the fruit, which is almond-shaped, is the portion used. An alcoholic tincture of the drug has been employed, but it is less valuable than a fluid extract, since the alcohol may counteract the sedative influence of the remedy.

**Physiological Action.**—The physiological effects have not been investigated. Under its therapeutic use, Dr. Starr observed no change in pulse, respiration, or temperature; no effect upon the pupils, no muscular weakness, no mental depression or stimulation, and no digestive disturbance. It appears to be quite innocuous, even in large doses, according to Dr. V. Paulet.

**Therapy.**—Simulo is one of the many agents which have been brought forward to cure cases of epilepsy, and in other nervous affections favorable results from its use have also been reported. Dr. V. Paulet found it to have decidedly good effects in hysteria and chorea.† Dr. W. H. White used the tincture of simulo in seven cases of epilepsy, giving 1 or 2 drachms three times a day. In all the patients considerable improvement took place, though complete cure was attained in none. Eulenberg administered it to four cases of epilepsy and three of grave hysteria, and with benefit in only one of the epileptics. In this instance it diminished the number of paroxysms at first, but afterward seemed to lose its effect. He considered simulo inferior to the bromides. Dr. M. Allen Star finds that it has some effect in modifying the frequency and severity of attacks of grand mal, but is in this respect inferior to the bromides. It is useless in petit mal and in hystero-epilepsy. About the only field of usefulness for simulo would appear to be when, for any reason, it is deemed necessary to temporarily suspend the use of the bromides. Dr. L. C. Gray, in several cases, found the drug useless.‡

The tincture in doses of 5 to 10 drops thrice daily, beginning five days before the expected period, is said to relieve dysmenorrhœa. Dr. Paulet recommends the drug as of service in ovaro-salpingitis.

## SINAPIS ALBA (U. S. P.).—White Mustard.

## SINAPIS NIGRA (U. S. P.).—Black Mustard.

### *Preparations.*

*Chartæ Sinapis* (U. S. P.).—Mustard Paper.

*Oleum Sinapis Volatile* (U. S. P.).—Volatile Oil of Mustard.

*Linimentum Sinapis Compositum* (U. S. P.).—Compound Liniment of Mustard (volatile oil of mustard 3, fl. ext. mezereon 20, camphor 6, castor-oil 15, alcohol q. s. ad 100 parts). For external use.

**Pharmacology.**—White and black mustard are the seeds of Brassica alba and Brassica nigra (Cruciferæ), respectively. They form the flour of mustard when ground to a fine powder; commercial flour of mustard is a mixture of both kinds of seeds ground together. The pungency of the moist powder is due to the volatile oil of mustard, which does not exist in the whole seeds. The black and white varieties each contain a crystalline substance,—in the former **Sinigrin,** in the latter **Sinalbin,**—together with an albuminous ferment, **Myrosin.** When water is added, both sinigrin and sinalbin are split up by the myrosin and produce a volatile oil which is not quite identical in the two mustards, that from the black mustard being the more pungent. (This is known as allyl sulphocyanate, while the other is acrinyl sulphocyanate.) The action of myrosin is suspended at 60° C. (140° F.); so that mustard poultice should not be made with boiling water. White mustard, even when ground and mixed with water, is inodorous, but when added to the black variety it increases the yield of volatile oil. Both kinds also contain fixed oil; as well as **Sinapine** (an alkaloid), **brassic acid,** and other vegetable principles.

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* *Therapeutic Gazette*, October 15, 1888.

† *American Journal of Insanity*, July, 1890.

‡ *Therapeutic Gazette*, June 15, 1889, p. 396.

**Physiological Action.**—When applied to the skin, if moisture is present, mustard-flour causes hyperæmia, and, if the action is continued, it will vesicate, making a painful and slow-healing blister. The seeds of white mustard have been used as a condiment and mechanical laxative, in tablespoonful doses after meals. Table-mustard is made by adding water to mustard-flour; it may also contain spices or vinegar.

**Therapy.**—Mustard-papers (4 inches square) are very convenient for applying counter-irritation, being always ready for use and only needing dampening with cold water, in pleurodynia, lumbago, colic, croup, and numerous other conditions requiring this treatment; applied to the calves of the legs, as well as other parts of the body. They should remain ordinarily about four or five minutes, but may remain longer; they should not be left on all night, for fear of making a slough which would leave a scar. Mustard poultices to the feet and legs are employed as derivatives in apoplexy and intoxication from alcohol or opium. In weak digestion, a little mustard, as a condiment with meats, assists digestion and stimulates the secretion of gastric and intestinal fluids.

Mustard foot-baths, made by adding a handful of ground mustard to hot water, is a good revulsant in recent colds, sleeplessness, amenorrhœa, headache, etc. Mustard-water is a useful emetic in narcotic poisoning. A hot mustard-bath is an efficient aid to other treatment in allaying maniacal excitement. It is of value, moreover, in cases of recession of the eruption in scarlet fever and measles.

In medicinal preparations, mustard is occasionally administered with advantage as an internal remedy. Obstinate hiccough has been relieved by an infusion made by steeping a teaspoonful of mustard in 4 ounces of boiling water for twenty minutes and then straining (Ringer). An alcoholic solution of the oil of mustard has been found of efficiency in chronic gastric and bronchial catarrh. The solution contains 24 drops of the oil to the ounce of spirit, and is given in doses of 3 to 5 drops in an emulsion. The same preparation is said to have been of service as a diuretic in dropsy. A mustard-whey, made by boiling ½ ounce of mustard-flour in a pint of milk, has also been utilized in dropsy.

**SODIUM.**—The metallic element, Sodium (Natrium). Not used in medicine, except in combination.

*Preparations.*

*Soda* (U. S. P.).—Soda, Caustic Soda.
*Sodii Acetas* (U. S. P.).—Sodium Acetate. *Dose*, gr. xv-ʒj.

*Sodii Arsenas* (U. S. P.).—Sodium Arsenate. *Dose*, gr. $\frac{1}{12}$–$\frac{1}{3}$.
*Sodii Benzoas* (U. S. P.).—Sodium Benzoate. *Dose*, gr. x–xx.
*Sodii Boras* (U. S. P.).—Sodium Borate, Borax. *Dose*, gr. x–xl.
*Sodii Bromidum* (U. S. P.).—Sodium Bromide. *Dose*, gr. xx–ʒj.
*Sodii Carbonas* (U. S. P.).—Sodium Carbonate (washing-soda). *Dose*, gr. v–xx.
*Sodii Carbonas Exsiccatus* (U. S. P.).—Dried Sodium Carbonate. *Dose*, gr. v–x.
*Sodii Bicarbonas* (U. S. P.).—Sodium Bicarbonate (baking-soda). *Dose*, gr. v–xl.
*Sodii Bicarbonas Venalis.*—Commercial Sodium Bicarbonate.*
*Sodii Chloridum* (U. S. P.).—Sodium Chloride (table-salt). *Dose*, gr. v–xl.
*Sodii Chloras* (U. S. P.)—Sodium Chlorate *Dose*, gr. ii–x.
*Sodii Hypophosphis* (U. S. P.).—Sodium Hypophosphite.† *Dose*, gr. x–xx.
*Sodii Hyposulphis* (U. S. P.).—Sodium Hyposulphite. *Dose*, gr. x–xx.
*Sodii Iodidum* (U. S. P.).—Sodium Iodide. *Dose*, gr. x–xl.
*Sodii Nitras* (U. S. P.).—Sodium Nitrate (saltpetre). *Dose*, ʒi–ij.
*Sodii Phosphas* (U. S. P.).—Sodium Phosphate. *Dose*, gr. v–℥j.
*Sodii Pyrophosphas* (U. S. P.).—Sodium Pyrophosphate. *Dose*, gr. v–xl.
*Sodii Sulphas* (U. S. P.).—Sodium Sulphate (Glauber's salt). *Dose*, ℥ss–j.
*Sodii Sulphis* (U. S. P.).—Sodium Sulphite. *Dose*, gr. xx–ʒj.
*Sodii Bisulphis* (U. S. P.).—Sodium Bisulphite. *Dose*, gr. x–ʒss.
*Sodii Salicylas* (U. S. P.).—Sodium Salicylate. *Dose*, gr. x–ʒj.
*Sodii Santoninas.*—Sodium Santoninate. *Dose*, gr. ii–x.
*Sodii et Potassii Tartras* (U. S. P.).—Sodium and Potassium Tartrate (Rochelle salt). *Dose*, ʒi–iv.
*Sodii Sulphocarbolas* (U. S. P.)—Sodium Sulphocarbolate. *Dose*, gr. ii–v.
*Liquor Sodæ* (U. S. P.).—Solution of Soda (5 per cent.). *Dose*, ♏v–x.
*Liquor Sodæ Chloratæ* (U. S. P.).—Solution of Chlorinated Soda (Labarraque's solution). Should contain at least 2.6 per cent. of available chlorine. *Dose*, fʒss–j.
*Liquor Sodii Arsenatis* (U. S. P.).—Solution of Sodium Arsenate (1 per cent.). *Dose*, ♏iii–v.
*Liquor Sodii Silicatis* (U. S. P.).—Solution of Sodium Silicate (specific gravity, 1300–1400),
*Mistura Rhei et Sodæ* (U. S. P.).—Mixture of Rhubarb and Soda. *Dose*, fʒij–℥j.
*Pulvis Effervescens Compositus* (U S. P.).—Compound Effervescing Powder, or, Seidlitz Powder. *Dose*, one powder.
*Trochisci Sodii Bicarbonatis* (U. S. P.).—Troches of Sodium Bicarbonate. Each gr. iij. *Dose*, one or more troches.
*Trochisci Sodii Santoninatis.*—Troches of Sodium Santoninate. Each, gr. ij. *Dose*, one to five troches.
*Sodii Nitris* (U. S. P.).—Sodium Nitrite. *Dose*, gr. j–iij.
*Sodii Ethylas.*—Sodium Ethylate. For external use.
*Pasta Londoniensis.*—London Paste is prepared by rubbing together equal parts of caustic soda and unslaked lime. For external use.

**Pharmacology.**—The metal sodium, a monatomic, metallic element, Natrium (Na. = 23), was discovered by Sir Humphrey Davy in 1807, the same year that he succeeded in isolating the metal potassium, which in many respects, it resembles. It is found only in the laboratory and in the arts, not being used in its own form in medicine. Many of its salts are official; they are generally white or colorless, soluble in water, and less irritant than the corresponding potassium salts. They tinge the light yellow, in the spectroscope, or when a small portion, on a piece of platinum wire, is held over burning alcohol. Sodium chloride occurs native in sea-water and in salt-mines, and is found in all the fluids and solids of the human body. Sodium urate is not soluble in water, and, therefore, when uric acid is formed in excess, deposits of sodium urate are apt to occur in various portions of the body. The potassium and lithium salts, with the uric acid, on the contrary, are soluble in water, and assist in carrying off from the system the less soluble uric acid. In gouty patients, therefore, soda-salts should be only cautiously given.

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* The commercial bicarbonate is used only for pharmaceutical purposes.
† Enters into the syrup of the hypophosphites.

**Physiological Action.**—Soda, when locally applied, in concentrated form, to muscle or nerve, is a paralyzing agent, but to a decidedly smaller extent than potassa. Caustic soda in its action resembles caustic potash, but has less tendency to spread. Solutions of the chloride are antiseptic, and table-salt, as an article of food, plays a very important part in digestion and in tissue change. Weak solutions of salt (5 to 6.5 parts per 1000), if injected into the veins, do not affect the integrity of the red blood-corpuscles. The carbonate may be used in the same manner, to replace a quantity of blood lost by hæmorrhage, or in the collapse of cholera. Applied to the skin, solutions of the bicarbonate are cleansing and non-irritant; and, in cases of burns or scalds, insect-bites, or ivy poisoning, a saturated solution rapidly relieves pain. Borax is also antiseptic and unirritating to the skin. The hyposulphite is antiseptic by virtue of the sulphuric acid which it contains. The ethylate is also an antiseptic, and decidedly caustic. Liquor sodæ is a valuable antacid, without affecting nutrition as much as potassa does, and it is less poisonous to the heart and nerves. The acetate, being the salt of an organic acid, becomes converted into the carbonate in the blood; it is diuretic, although to a less extent than the potassium acetate. Sodium carbonate is used in pharmacy in preparing other salts; as it is a good alkali for combining with grease or fat, it is found in every household as "washing-soda." The bicarbonate is used as an antacid when there is an excess of acid in the stomach; given when the stomach is empty, it stimulates the secretion of gastric juice.

Linossier and Lemoine conclude that sodium bicarbonate, in all amounts, excites gastric secretion, the most useful dose, according to their observation, being 75 grains, given before a meal. An increased secretion is maintained beyond the day of administration.

It also increases the alkalinity of the blood, reduces the acidity of the urine, and relieves irritability of the bladder. The chloride is a very convenient emetic, especially combined with mustard-water. Hæmorrhages are sometimes checked by it through reflex influence. The nitrate is refrigerant in fever, and increases the secretions of the intestinal tract. The nitrite acts like the other nitrites, in depressing the heart's action and reducing blood-pressure. The sulphate is a bad-tasting and harsh cathartic; it is a common constituent in purgative mineral waters, where its effects are enhanced and modified by natural combination.

In experiments undertaken to determine the influence of alkalies on the excretion of uric acid, made by Dr. Spilker, under the direction of Prof. Salkowski, it was found that the addition of alkalies to the diet diminishes the excretion of uric acid, or, rather, its formation in the human subject, while in the dog the reverse was the case.* This should teach us to accept, with some reserve, the deductions from physiological experiment in the laboratory, with regard to the action of medicine upon the lower animals, especially where they conflict with clinical teaching and the results of experience.

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* *Therapeutic Gazette*, October 15, 1890, p. 706.

**Therapy.**—Soda, which is a corrosive poison in concentrated form, the symptoms and treatment being the same as for poisoning by the corresponding potassium salts, may be used locally as a substitute for caustic potash, being more manageable and less severe. A combination of equal parts of soda and lime, known as London paste, is a favorite caustic application, especially for the removal of morbid growths, by some practitioners. Garretson employs London paste as follows for the removal of tonsil-glands, as well as for the destruction of certain warts:—

"To apply this agent, the practitioner uses enough water to convert the powder into a thick paste, which he directs against the body to be removed by means of the cup found upon the handle of a director. Each application secures a certain extent of slough. Five or six repetitions are necessary. London paste worked into the interstices of seed-warts allows of their being brushed off in a couple of minutes. Return is uncommon." Sodium ethylate is one of the most powerful caustic preparations that can be used. It combines with water of the tissues, and continues to act deeply in abstracting this element. It is serviceable in destroying warts and various morbid growths, but is liable to leave the skin scarred on account of its destructive action upon the tissues. The writer has employed sodium ethylate with great benefit in lupus erythematosus and vulgaris; likewise in callous ulcers, epithelioma, and in thickened and ulcerated spots of syphilis. If sodium ethylate is used for the removal of excessive growth of hair, especially upon the face (polytrichia), as has been recommended by Jameson, the physician may expect, from the observations made by the author, more or less scarring of the skin on account of the destructive action of this caustic upon the true skin and deeper structures Gamberini has derived good results in psoriasis from inunction with a 2-per-cent. mixture of sodium ethylate with olive-oil.

Sodium bicarbonate, in powder or solution, is applied to burned or scalded surfaces, and quickly relieves pain. It can also be used to subdue inflammation in sun-burn, rhus poisoning, pruritus, eczema, insect-bites, etc. A 1-per-cent. solution of sodium bicarbonate is a good injection in gonorrhœa. In a number of cases intussusception of the bowel has been reduced by the action of carbonic-acid gas which, in an emergency, may be generated within the intestine by the action of citric acid upon sodium bicarbonate. The solutions are separately injected through a tube passed into the rectum. According to Dr. Duckworth, the local use of a solution of sodium carbonate in the strength of ½ drachm to the ounce of warm water will often relieve toothache dependent upon dental caries. In the cough of pulmonary tuberculosis, when the bronchial secretion is scanty and viscid, Dr. E. Maragliano states that good results may be obtained by the use of the following solution as a spray:—

| | |
|---|---|
| ℞ Sodii bicarbonat., | gr. xv–xxx. |
| Morphin. hydrochlor., | gr. ¾. |
| Aq. dest., | f℥ iiiss. |

M.

Borax acts very similarly, but is more antiseptic on account of containing boric acid. Both the bicarbonate and the borate are also employed in solutions for washing out the bladder in cystitis, for injecting into the auditory canal to remove cerumen from the ear, and for intravenous injection in collapse from cholera. etc. The following combinations containing one of the sodium preparations will be found serviceable:—

| | | |
|---|---|---|
| ℞ Sodii bicarbonatis, | | ℥ss. |
| Aquæ camphoræ, | | |
| Aquæ menth. pip., | āā | f℥iv. |

M. Sig.: For itching and burning of the mucous membrane and skin in the various eruptions upon the integument.

| | |
|---|---|
| ℞ Liq. sodæ chloratæ, | fʒj vel ʒiij. |
| Tinct. kino, | f℥ij. |
| Aquæ, | f℥iij. |

M. A disinfectant gargle for ulceration of the throat.

| | | |
|---|---|---|
| ℞ Sodii benzoat., | | gr. xx. |
| Creosoti, | | ♏v. |
| Glycerini, | | |
| Aquæ rosæ, | āā | f℥ss. |

M. Employ with an atomizer in nasal catarrh, pharyngitis, and in laryngitis.

| | | |
|---|---|---|
| ℞ Sodii bicarbonatis, | | ʒiij. |
| Glycerini, | | |
| Aquæ hamamelidis dest., | āā | f℥iij. |

M. To allay itching and burning of the skin, especially in eczema, lichen, urticaria dermatitis, burns, and frost-bite.

The solution of chlorinated soda, or Labarraque's solution, also may be advantageously applied in dermatitis due to the poison ivy. In acute tonsillitis, sodium salicylate may be rubbed upon the tonsils with the finger, with excellent results. In this affection a solution of the bicarbonate has been beneficial, applied upon a brush or mop, or used as a gargle. For catarrhal conditions, chronic bronchitis, etc., a solution of this salt may be used with the steam-atomizer, with hamamelis, belladonna, or other combinations if desired. Sodium chlorate is recommended by Prof. Traill Green, of Easton, to be used in place of potassium chlorate in acute affections of the throat or fauces. A 2-grain lozenge made with tragacanth is just as efficient, locally, as the official potash-lozenge, and will not cause depression of the heart like potash. Dr. C. Slagle, of Minneapolis, recommends sodium sulphite as an excellent local application in diphtheria, employed as a gargle, spray or painted upon the affected surface with a camels'-hair brush. Internally he prescribes the same salt in combination with sulphur and calomel. In children suffering with oxyuris vermicularis, or seat-worm, injections of sodium chloride solution will bring away the parasites and relieve the itching. Sodium hyposulphite is employed by Dr. Ohmann Dumesnil in the treatment of scabies. After a morning bath the patient is directed to apply:—

| | |
|---|---|
| ℞ Sodii hyposulphit., | ℥vj. |
| Aq. destillat., | f℥vj. |

M.

The solution is allowed to dry upon the skin. Before going to bed the skin is bathed with the following lotion, which may be diluted if found too strong:—

| | | |
|---|---|---|
| ℞ Acid. hydrochloric. dil., | | f℥iv. |
| Aq. destillat., | | f℥vj. |

M.

The sulphocarbolate is useful as a disinfectant, being less irritant and not caustic; but for internal use the salicylate is safer. Sodium bicarbonate is used as an antacid in gastritis and sour stomach, and affords temporary relief, especially in combination with mint or rhubarb. M. Huchard recommends the exhibition of large doses (from 2 to 10 drachms daily), of this salt in the hyperacidity of the stomach which sometime accompanies diabetes, in the gastric crises of locomotor ataxia, cardiac disease with acidity of the stomach and in hepatic maladies. He mentions a case of diabetes in which this treatment averted threatened coma.

The bicarbonate, with rhubarb, is especially useful in cases of catarrhal jaundice. Sodium bicarbonate is of benefit when the urine is acid, and in all forms of cystic irritation, and is especially useful in renal calculi, cystitis, gonorrhœa, gleet, stricture, and in enlarged prostate. The following prescriptions, containing sodium bicarbonate are recommended:—

| | | |
|---|---|---|
| ℞ Sodii bicarbonatis, | | ʒiiiss. |
| Tinct. zingiberis, | | |
| Tinct. capsici, | āā | fʒj. |
| Tinct. nucis vomicæ, | | ♏cc. |
| Tinct. gent. comp., | q. s. ad | f℥v. |

M. Sig.: Two teaspoonfuls in water, three times a day, in acid dyspepsia.

| | | |
|---|---|---|
| ℞ Sodii bicarbonatis, | | ʒiiss. |
| Glycerini, | | |
| Aquæ menth. pip., | āā | f℥ij. |

M. Sig.: Two teaspoonfuls after meals, in acid dyspepsia.

| | |
|---|---|
| ℞ Sodii bicarbonatis, | ʒj. |
| Pulv. ipecacuanhæ et opii, | gr. xl. |

M. et ft. chartæ no. xx.

Sig.: A powder every two or three hours, for cystitis or irritable bladder or prostate.

| | |
|---|---|
| ℞ Sodii bicarbonatis, | gr. xl. |
| Hydrargyri chloridi mitis, | gr. ij. |

M. et ft. chartæ no. xij.

Sig.: A powder every two or three hours, for acute gastritis.

When used as an antidote to acids in corrosive poisoning, the carbonate is better than the bicarbonate, on account of their being less carbon dioxide formed. The hyposulphite is a useful antiseptic in sarcinous vomiting and infectious dyspepsia. This salt was highly esteemed by Dr. Cadogan-Masterman, who thought, however, that 5-grain doses are more efficient than larger quantities and prescribed it as follows:—

| | | |
|---|---|---|
| ℞ Tr. gentian. co., | | fʒij. |
| Tr. capsici, | | fʒss. |
| Sodii bicarbonat., | | ʒij. |
| Sodii hyposulphit., | | ℈ij. |
| Chloroformi, | | ♏viij. |
| Aquæ, | q. s. ad | f℥viij. |

M. ft. sol. Sig.: Two tablespoonfuls three times a day.

Sodium hyposulphite is said to be of value in malarial hæmaturia. Sodium phosphate, on account of its cholagogue effects, is useful in cases of inaction of the liver in children who pass clay-colored stools. Constantin Paul prefers sodium phosphate to sulphate as a laxative, and administers it in the form of a lemonade, according to the subjoined formulæ:—

| | |
|---|---|
| ℞ Sodii phosphat., | ʒvj½. |
| Ess. limonis, | gtt. xx. |
| Syr. simpl., | f℥ij. |
| Aq. destill., | f℥vj. |
| M. | |

| | |
|---|---|
| ℞ Sodii phosphat., | ʒvj½. |
| Ess. limonis, | ♏xxv. |
| Acid. citrici, | |
| Sodii bicarb., | āā ʒjss. |
| Syr. simpl., | f℥ij. |
| Aq. destill., | f℥viij. |
| M. An effervescing mixture. | |

Sodium phosphate is useful in habitual hepatic congestion and lithæmia.

Dr. Crocq, Jr., of Brussels, has employed with advantage subcutaneous injections of sodium phosphate in various affections of the nervous system. The formula which he makes use of is:—

| | |
|---|---|
| ℞ Sodii phosphat., | gr. xxx. |
| Sp. rectificat., | f℥j. |
| Aq. destillat., | f℥iv. |
| M. | |

Of this solution 15 minims are injected daily and the amount is gradually increased to 45 minims. In trifacial neuralgia, neurasthenia and hysteria the effects were very satisfactory. He regards the remedy thus administered as a powerful nerve tonic, capable of curing functional disease, though it has only a palliative effect in organic disorders of nervous centres. Remarkable improvement has, however, been produced by this method in locomotor ataxia. Dr. Forbes Winslow has reported a case of the last-named malady, in which typical symptoms were present, but disappeared after 25 injections had been made. The patient seemed to be completely cured. Professor Lemoine combines sodium phosphate with potassium bromide in the treatment of epilepsy, giving 25 grains of the former salt at each dose. In order to overcome pain due to anæmia or neurasthenia, M. Huchard uses an artificial serum, 80 to 160 minims of which are subcutaneously injected. His formula is:—

| | |
|---|---|
| ℞ Sodii phosphat., | ʒijss. |
| Sodii chlorid., | ʒjss. |
| Sodii sulphat., | gr. xxxvj. |
| Acid. carbolic. pur., | gr. xxiv. |
| Aq. destillat., | f℥iij. |
| M. | |

Increasing doses of sodium phosphate, given subcutaneously, are said by M. J. Luys to have a beneficial effect in morphinomania.

The sodium acetate is not as deliquescent as potassium acetate, and has this advantage over the latter salt. It has been given with benefit as an antacid in acute rhematism, and as a diuretic in dropsies. Sodium acetate is likewise serviceable in gout, and in the treatment of irritation of the genito-urinary apparatus. The appended prescription is suggested :—

| | |
|---|---|
| ℞ Sodii acetatis, | ʒiij. |
| Syr. aurantii, | f℥iij. |
| Spiritus ætheris nitrosi, | f℥ij. |

M. Sig.: Two teaspoonfuls in water, every two or three hours, for rheumatism, gout, or genital irritation.

Sodium benzoate is a safe and effective antipyretic. It has been employed for its antiseptic virtues in phthisis, diphtheria, the eruptive fevers, and in irritation of the genital organs. The following combination of sodium benzoate is recommended :—

| | |
|---|---|
| ℞ Sodii benzoatis, | ʒiij. |
| Ext. tritici repentis fl., | |
| Ext. buchu fl., | āā f℥iiss. |

M. Sig.: A teaspoonful or two, every two or three hours, for cystitis, or for an irritable bladder and prostate.

Liegeois recommends sodium benzoate in large doses in the treatment of pharyngitis. In laryngitis and acute bronchitis, he prescribes :—

| | |
|---|---|
| ℞ Sodii benzoat., | ʒj. |
| Tr. aconit., | ♏xx. |
| Aq. lauro-cerasi, | fʒj. |
| Syrup. tolutan., | |
| Syrup. codein., | āā f℥ij. |
| Aquæ, | f℥ij. |

M. Sig.: To be taken in the twenty-four hours.

Administered persistently in Bright's disease, he has obtained good results from this salt associated with tannic acid. It is useful in lithiasis by converting insoluble urates into soluble hippurates, and thus facilitating their removal from the system.

The following mixture is pronounced useful in chronic bronchitis by a writer in *La Tribune Médicale* :—

| | |
|---|---|
| ℞ Sodii arsenat., | gr. jss. |
| Sodii iodid., | ʒijss. |
| Aquæ, | f℥ix. |

M. Sig.: A tablespoonful during twenty days of the month.

Under the name of uricedin, a mixture has been recommended as a solvent for stone in the bladder. According to the analysis of Dr. Goldmann, uricedin consists of 30 parts of sodium sulphate, 10 parts of sodium carbonate and 60 parts of sodium citrate.

The pulvis effervescens compositus (U. S. P.), or Seidlitz powder, is a mixture taken while effervescing, containing 40 grains sodium bicarbonate and 2 drachms of Rochelle salt (blue paper) and 35 grains of tartaric acid (in a white paper).* The contents of each paper are dissolved in a wineglassful or more of water, and drunk while effervescing, to relieve simple constipation. In obstinate vomiting, small doses of Seidlitz powder are often efficient in overcoming the nausea and retching. A teaspoonful of sodium chloride, dissolved in a tumblerful of water and taken before breakfast, will often answer the same purpose as some mineral waters. In full doses sodium sulphate is an active cathartic; in smaller quantities it acts as an aperient and diuretic. This salt has a bitter and nauseous taste, which may be disguised by the addition of a few drops of aromatic sulphuric acid, or by giving it in lemonade. In daily doses of 2½ drachms sodium sulphate has been administered with decided success in dysentery. It is recommended that the sodium salt be associated with naphthol or other efficient intestinal antiseptic, a solution of the latter being injected into the bowel.

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* These may also be put up without Rochelle salt, and were formerly official in this shape as soda-powders, or Pulveres Effervescentes.

Sodium chloride has been injected into the veins in collapse from severe hæmorrhage and cholera. In order to avoid the disadvantages and delays of this method, Dr. Warman made trial of salt by the rectum. In a number of cases of uterine hæmorrhage he found this procedure to be followed by the most gratifying results. He employed about a tablespoonful of table-salt, dissolved in a quart of water. Dr. Ilberg, having observed good results from the subcutaneous injection of a solution of salt in a case of gastric ulcer, made use of the same method in a number of insane patients who refused food. The treatment was satisfactory in all but one case. Experimenting upon himself he found that the installation excited thirst and hunger. About a pint of a ¾-per-cent. solution was slowly introduced through a trocar into the cellular tissue of the back or thigh, and its absorption aided by gentle massage. Max Gordon reports three cases of poisoning from carbonic oxide or coal-gas successfully treated by the intra-venous injection of a salt solution after a preliminary bleeding.

Subcutaneous or intra-venous injections of a solution of table-salt have been found useful in relieving uræmic dyspnœa or eclampsia. Sodium sulphide is recommended in the treatment of lead poisoning by M. Peyrou, given in the dose of 5 to 8 grains a day. The observation was based upon experiments upon animals and was confirmed by M. Quinquaud, who had observed that the salt named produced an increased elimination of lead in the urine. Sodium sulphide occasions the same result in mercurial intoxication, and must be regarded as an excellent eliminative agent in all cases of metallic poisoning.*

Sodium chlorate is praised as a remedy in the treatment of epitheliomata of the mucous membrane of the upper digestive passages. In a communication to the French Association for the Advancement of Science, M. Brissaud stated that he had long depended upon potassium chlorate in these cases, but was led to prefer the sodium-salt on account of its greater solubility and less toxicity. In cancer of the stomach, M. Brissaud had obtained a cure, or, at least, an almost incredible amelioration by the administration of daily doses of 3 to 4 drachms. Hæmorrhages ceased, cachexia disappeared, and the tumor vanished in the course of several weeks. He begins with doses of 2 to 2½ drachms a day and, if no improvement takes place, he increases the amount to 4 drachms. He does not employ the drug if the slightest degree of albu-

* *The Medical Bulletin*, February, 1894.

minuria is present. M. Lépine, at the same meeting, declared that in the dose of 4 drachms sodium chlorate might cause the formation of methæmaglobin in the blood.

In a case of angina pectoris, Dr. Gingeot obtained good results from sodium iodide given in alternation with trinitrin, the former being taken for six and the latter for two weeks. Gordon Sharp has employed the sodium nitrite in angina pectoris and irregular cardiac action, and, on account of its superior stability, recommends it as a substitute for amyl nitrite. The maximum dose is given as 5 grains, but it is stated that 1 or 2 grains are usually sufficient.

Sodium salicylate is used very largely in the treatment of acute rheumatism, and rheumatic throat inflammation, pyrexia of influenza, etc. In acute rheumatism, about 2 drachms a day, in divided doses, relieve pain and fever and make the patient more comfortable. Dr. H. Radcliffe Crocker reports that he has frequently derived benefit from the use internally of sodium salicylate in psoriasis, especially in hyperæmic cases of recent development. He has also witnessed marked improvement follow its administration in a case of lupus erythematosus.* Germain Sée commends this salt as an efficient cholagogue, which increases the watery portion of the bile and is therefore of value in promoting the expulsion of gall-stones.

Sodium salicylate, mixed with theobromine, has such diuretic effects that it has been called **diuretin,** of which the dose is a drachm, or a drachm and a half, daily, in divided doses. (See Theobroma.) Good results may be obtained in fevers, by using the fluid extract of erythroxylon coca to sustain the heart's action and support strength, at the same time that sodium salicylate is used to keep down temperature. After the administration of large doses of sodium salicylate a crystalline deposit will sometimes form upon the skin. It is uncertain whether the crystals are of the unaltered drug or of decomposition products. A neutral, or acid, sulpho-salicylate of sodium has been prepared. The acid salt is a white, crystalline powder, soluble in water, but almost insoluble in alcohol and ether. Its taste is less unpleasant than that of sodium salicylate, and it is said to be less apt to cause vertigo and buzzing in the ears. This preparation has been used with success in acute rheumatism.

Sodium nitrate in doses of 3 or 4 grains, is recommended by Pearce as serviceable in asthma. Dr. Angrisani, from an experience in 10 cases, considers sodium nitrate as of service in relieving maniacal excitement. He gave it in daily doses of 45 to 75 grains. It was usually well borne and relieved high arterial tension, restlessness and hallucinations. In two patients, who suffered from epilepsy of psychical origin, the attacks could be prevented by the administration of 1½ drachm of the remedy in a single dose immediately after the appearance of the aura.

Sodium nitrite is a white, opaque crystalline substance, of a mild saline taste and destitute of odor. It is a deliquescent salt, readily soluble in water and slightly soluble in alcohol. It is best administered in an alkaline solution on account of its liability to be decomposed by the gastric juice. The peculiar properties which this compound pos-

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*[*International Medical Magazine*, August, 1895.]

sesses depend upon the nitrous acid which it contains. Its physiological and therapeutical effects very closely resemble those of amyl nitrite. Of the pure salt the beginning dose should never exceed 2 or 3 grains. Sodium nitrite has afforded relief in a number of cases of epilepsy. In angina pectoris its action is akin to that of nitroglycerin and amyl nitrite, but is less quickly produced and is of longer duration. It may be beneficial in paroxysms of asthma and dyspnœa.

Sodium tellurate was brought forward by Neusser in 1890 as a remedy for the night-sweats of phthisis. It has been used in a number of cases by Professor Combemale, who found it efficient in single daily doses of about 1 grain. It is open to the reproach, however, of disturbing digestion and communicating a strong garlicky odor to the breath. Sodium tellurate is also able to suppress the sweating of rheumatism, typhoid fever, syphilitic phthisis and dyspepsia.

A 1- or 2-per-cent. aqueous solution of sodium fluoride has recently been used with advantage as an antiseptic wash to the bodies of persons suffering from infectious disease, in the erythema of new-born infants, and as an injection in vaginitis and cystitis.

## SOLANUM CAROLINENSE.

This plant grows in the Southern United States, and is known under a number of popular names, as ground-potato, poison-potato, horse-nettle, etc. It was introduced to medical notice by Dr. Napier, of Blenheim, S. C., who regards it as a diuretic, anodyne and antispasmodic. Dr. Napier reported favorably of its action in convulsions of various origin and in traumatic tetanus. He employed a preparation of the root and berries in whisky and water. Mr. J. U. Lloyd has recently isolated from the root an alkaloid, which he calls solnine, in order to distinguish it from solanine, with which it does not seem to be identical. Solanum Carolinense is reported to be of service in epilepsy, particularly as it occurs in children.

## SOLANUM PANICULATUM.—Jerubeba.

### *Preparation.*

*Extractum Solani Paniculati Fluidum.*—Fluid Extract of Solanum Paniculatum (from the root). *Dose,* ♏v–xxx.

**Pharmacology.**—Solanum paniculatum (Solanaceæ), or jerubeba, is a common, shrubby plant, which grows in the wild country of the North of Brazil. It has a woody stem, and reaches a height of eight or ten feet. The stem, branches, and under side of the leaves are almost covered by a white, downy hair. An alkaloid, termed **Jerubebin,** has been found in the fruit and the root. Dr. Domingos Freire, of Rio Janeiro, describes two resinoid principles obtained from this plant, one of which is inactive while the second has a powerful purgative effect.

**Physiological Action and Therapy.**—The effects of jerubeba upon frogs and guinea-pigs have been investigated by Duprat. Torpidity soon came on after hypodermic injection of a hydro-alcoholic extract, and reflex movements disappeared. Respiration was retarded, and the action of the heart slow and irregular. A minute quantity of jurubebine hydrochlorate, injected by Dr. Domingos Freire into a small bird, caused lethargy with contracture of the extremities, followed by tetaniform convulsions and death.

Jerubeba is an excellent laxative, and is said to be valuable in the treatment of habitual constipation. The drug is held in great esteem in Brazil, where it is considered tonic and alterative. In some cases of liver disease Dr. A. Michaelis found jerubeba to increase the appetite and relieve indigestion.

### SOLIDAGO.—Solidago, Goldenrod.

**Dose,** gr. xxx–ʒij.

**Pharmacology.**—The Solidago odora (Compositæ), or fragrant goldenrod, is a conspicuous feature of autumn landscapes in the northern United States. It has many varieties, but the usual form bears a terminal spike, or one-sided raceme, of yellow flowers. The plant is yellowish green, fragrant, and yields, by distillation, a **volatile oil,** resembling anise in odor. The fluid extract, made with diluted alcohol as a menstruum, is often used as a flavoring excipient. A solid extract may be obtained by evaporating the fluid extract to the proper consistence and incorporating with it one-twentieth of its weight of glycerin.

**Physiological Action.**—Goldenrod is carminative and gently stimulant. The hot infusion produces diaphoresis and relieves the pains of dysmenorrhœa.

**Therapy.**—This drug is scarcely used by the profession, but possesses some, though not very decided, medicinal value. The decoction and warm infusion are used in domestic practice to produce diaphoresis, to relieve colic, and to promote menstruation. The oil may be used for similar purposes, and also as a carminative to relieve flatulence, etc.

### SOMNAL.—Ethylated Chloral-Urethan.

**Dose,** ♏xx–fʒss.

**Pharmacology.**—In 1889, Dr. S. Radlauer, of Berlin, brought to the notice of the profession a compound of chloral, urethan, and alcohol, which he considered a definite compound and not a simple mixture of these substances. It is a colorless liquid, resembling chloroform in appearance; very slightly, if at all, soluble in cold water, but soluble in hot water and in alcoholic solutions. The odor is faint, resembling spirit of nitrous ether; the taste is very pungent. For administration it requires free dilution, and can be given with simple elixir, whisky, or syrup of liquorice.*

**Physiological Action.**—Dr. W. Gilman Thompson,† from a series of experiments, both physiological and clinical, concluded that "the effects of somnal are much more striking and certain than those of urethan, and far less depressing than those of chloral. There is no vertigo or depression after taking somnal, such as may follow the use of sulphonal. The action of somnal is usually very prompt, and doses of ½ drachm, disguised in a little syrup of tolu or whisky, are always well borne, easily taken, and entirely without deleterious effect. The drug, in doses of a drachm, is not powerful enough to decidedly control delirium tremens, maniacal delirium, or severe pain. In doses of 30 or 40 minims, somnal is a safe and reliable hypnotic for ordinary insomnia." The blood-pressure is increased under somnal instead of being depressed, as it is after taking chloral. It does not disturb digestion, and does not affect the pulse or temperature. Ordinary doses cause the respiration to become slow and full, while after ingestion of a toxic amount the breathing is rendered shallow, rapid, and irregular.

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* "Somnal: a New Hypnotic," by Frank Woodbury, M.D., *Dietetic Gazette*, July, 1890.
† *New York Medical Journal*, November 29, 1890.

An adverse opinion regarding this substance has been published* by Dr. Langgaard, who maintains that its narcotic effect is less than that of chloral, appears later, and is of shorter duration. Langgaard affirms that respiration and circulation are affected in the same manner, and, at least, as energetically as by chloral hydrate. The blood-pressure sinks, in rabbits, to 40 millimetres (15¾ inches) of mercury, or even lower, after doses that only produce two hours' light sleep.

**Therapy.**—Somnal, as generally observed by all who have used it, is a valuable hypnotic for cases of simple insomnia and sleeplessness after acute diseases, delirium tremens, parturition, etc. Dr. Evensen states, as a result of his experience, that somnal may be employed in chronic mania and quiet melancholia, but is without effect in acute mania. It should not be used in chronic interstitial nephritis and endarteritis with abnormally high tension, as it would increase the latter condition. Pain or cough is not much affected, though soothed by the sleep produced. Out of 54 various cases coming under Dr. Thompson's care, it produced sleep in about 50 per cent. within fifteen minutes, and in 43 cases out of 54 within an hour. In 6 cases only did it fail to produce sleep, and in some of these it had a quieting and soothing effect. In an obstinate case of insomnia in a business man, Dr. George H. Pierce administered 40 drops of somnal at a dose, in milk, and the patient slept for fourteen hours and wakened refreshed; previously he had run the gamut of the usual hypnotic remedies without benefit. The continuance of somnal for a short time entirely cured him and overcame a habit which had been formed for years. Owing to its comparative innocuousness it may be used in combination with syrup of tolu for fretful infants during dentition. Somnal is not adapted for use in cases accompanied by gastro-intestinal difficulties.

### SOZOIODOL.—Di-iodo-phenol-sulphuric Acid.

**Pharmacology.**—From phenol is derived, by combination with iodine and sulphuric acid, the remarkable substance, sozoiodol, which was first discovered by one of our own countrymen in San Francisco; but it was not until its manufacture was conducted upon a larger scale in Europe that it could be obtained sufficiently pure for medicinal use. The components of this remedy would indicate its value; it contains 55 per cent. of iodine, 20 per cent. of phenol, and 7 per cent. of sulphur. It forms salts with alkalies and with metals; those most used are potassium, sodium, mercury, and zinc. As manufactured in this country by the Mallinckrodt Chemical Company, of St. Louis and New York, in a pure form, the salts are generally perfectly white, odorless, and vary in solubility, the mercury salt being the least soluble. The potassium salt, with 2 parts of talc or other inert vehicle, may be used as a substitute for iodoform, being free from all the objectionable features of the latter drug.

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* *Süddeutsche Apotheker-Zeitung*, November 21, 1889; *Medical Bulletin*, February, 1890, p. 56.

**Physiological Action.**—The sodium and potassium sozoiodolates are non-irritating, and may be used in full strength as antiseptics and slight astringents. The mercurial and zinc salts are more active, and are used in solution (10 to 20 per cent.) for the same purposes. In solutions ranging in strength from ½ to 2 per cent., sozoiodol and its combinations are destructive to the micro-organisms of suppuration. Sodium sozoiodol has been given to rabbits in doses of 1 gramme (15½ grains) without producing any toxic effect. Sozoiodol is not decomposed within the body, but passes through the organism unchanged. According to Buffalini, the quantity of urea eliminated after the ingestion of sozoiodol is materially diminished, though the quantity of urine is increased.

**Therapy.**—As a topical application in uterine catarrh or ectropion, Nitschmann praises the soda salt, which is to be blown directly on the cervix and a dry tampon placed over it. He also uses a 5- to 7-per-cent. solution in rhinitis hypertrophica, ozæna, acute coryza, and in inflammations of mucous membranes generally, applied in a douche or by means of a camel's-hair brush.

Dr. Scharf, of Constantinople, and the late Dr. Guttmann, of Berlin, have reported good results from the insufflation of the nasal cavities with sodium sozoiodol in whooping-cough. About 4 grains were used each day. The number and the severity of the paroxysms was reduced within a few days and in some cases the attacks ceased after about a week's treatment.

A 5-per-cent. sodium sozoiodol solution has proved to be useful as a collyrium in acute purulent conjectivitis and in ophthalmia neonatorum. The combination with zinc is commended in chronic inflammation of the ear and upper air-passages. Dr. Seifert, of Würzburg, has obtained satisfactory results in tuberculous ulcers of the larynx from insufflation of sodium sozoiodol diluted with an equal bulk of some innocuous powder, such as sugar of milk. The sozoiodol combinations have been applied with success, it is said, to unhealthy wounds and ulcers, parasitic skin diseases, eczema, impetigo, burns, dermatitis, and cracked nipples.

A 2-per-cent. solution of zinc sozoiodol is a useful gargle in stomatitis and pharyngitis. A 1-per-cent. ointment of mercury sozoiodol, made with lanolin, has proved a beneficial application to scrofulous and syphilitic ulcers. Gaudin employs a 4-per-cent. plaster of the mercurial salt as a dressing to chancres.

Sozoiodol preparations have been advantageously employed in dentistry as disinfectant remedies.

An interesting observation was made by C. Schwarz, who gave 2 grammes (31 grains) daily of sodium sozoiodol to a diabetic patient without any restrictions as to diet. The symptoms at once improved, the urine and sugar diminished, and in two months not a trace of sugar could be found.* Buffalini tried the drug in phthisis (16 grains daily) without results.

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* Annual of the Universal Medical Sciences, 1890, vol. v, p. A-124.

The sodium salt has been recommended as a substitute for carbolic acid or creosote in cases of infectious dyspepsia, and may be administered in daily doses of 1 to 3 grammes (15½ to 46½ grains). In affections of the external ear accompanied by free discharge Dr. Max Teichmann, of Berlin, reports good results from the use of potassium sozoiodol as a dusting-powder.

Lithium sozoiodol has seemed to be beneficial in several cases of articular rheumatism, the doses being the same as those of the sodium salt.

For insufflation in ozæna, rhinitis and rhino-pharyngitis, the zinc and mercury compounds may be used, diluted with considerable excess of milk-sugar; the sodium and potassium salts may be employed pure or diluted to 3 or 10 per-cent. solutions. If a prolonged action is desired, the potassium salt is used, either alone (10 per cent.) or mixed with talc or sugar. In urethritis or vaginitis, the zinc sozoiodol, in 2-per-cent. solution, answers well as an injection, used several times a day. Professor Schwimmer has used mercury sozoiodol hypodermically in syphilis with satisfactory results. His formula is:—

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|---|---|
| ℞ Hydrarg. sozoiodol., | gr. xij. |
| Potass. iodid., | gr. xxiv. |
| Aq. destillat., | f ʒ iiss. |
| M. | |

Of this solution he injects once a week 10 minims, representing about 1¼ grains of the salt.

**SPARTEINE.** See Scoparius.

**SPECIES** are mixtures of various comminuted vegetable drugs prepared for making extemporaneous infusions or decoctions, either by the dispensing pharmacist or the purchaser. Some are cathartic in their action, others diaphoretic and expectorant. They are often sold as "teas," on account of the manner of preparation.

**SPERMINI HYDROCHLORAS.—Spermine Hydrochlorate** or **Muriate.**
**Dose,** gr. ¼ to j, hypodermically.

**Pharmacology.**—Spermine, according to Dr. G. Archie Stockwell, of Detroit (from whose papers, in the *Therapeutic Gazette*, on Brown-Séquard's discovery, the following extracts are taken), is the true factor in inducing the physiological phenomena chronicled by M. Brown-Séquard, in his communication to the French Academy which created so much stir a few years ago. It is obtained from the testicular juice of the lower animals by a carefully-conducted process, which protects the product from contamination by infectious micro-organisms and isolates it, chemically pure, as a salt of hydrochloric acid. Spermine is a crystalline substance, soluble in water and absolute acohol, but insoluble in ether. It absorbs water and carbonic acid from the atmosphere.

**Physiological Action.**—From experiments upon rabbits, Dr. Stockwell declares that it invariably produced powerful and prolonged stimulation of the sympathetic nervous system, most strongly manifested through the spermatic plexus. It stimulates the vaso-motor centre, increases blood-pressure, and adds oxidation. In toxic doses it induces distressing tetanic spasm and interferes with respiration by spasmodic fixation of muscles, including the diaphragm. Cutaneous hyperæsthesia and increased muscular activity were observed. Sexual erethism was marked in many instances.

**Therapy.**—The hypodermic injection of an extract from the recent testicles of mammals was found by Brown-Séquard * to have a stimulating effect upon nutrition, and to be especially active as a restorative in failing nutrition due to old age. Dr. H. P. Loomis, of New York, found that the injections, "as claimed, produce nutritive modifications in the tissues of elderly men, due, probably, to stimulation of the nerve-centres." In tuberculosis this substance has also been recommended.† Marked improvement has been reported as occurring in some cases of leprosy after the injection of testicular fluid. In locomotor ataxia and various forms of paralysis the same treatment has been followed by amendment. Several hundred cases of tabes have been treated by this method by different observers and in a very large proportion the symptoms of the disease were unmistakably relieved. In hysteria, on the contrary, little or no good has resulted from the injections. They were also found inefficient in epilepsy. In delirious epilepsy and in various forms of insanity the practice has been followed by improvement. In anæmia, also, good results have been obtained. Brown-Séquard claimed that testicular fluid had been used with decided advantage in about 100 cases of cancer, in nearly all of which cessation of pain and hæmorrhage and cicatrization of ulcers demonstrated the efficacy of the method which he advocated. He also asserted that he was cognizant of cases of disappearance of uterine fibromata and of morbid deposits of connective tissue in the heart, arteries and muscles. It is stated by those who have practised this method that better results have, as a rule, been obtained in organic than in functional diseases. In chorea, however, Professors Ollier and Tessier and other writers have witnessed rapid improvement in consequence of these injections. Notable amelioration has, in a large number of cases of tuberculosis, followed the use of these injections. Professor Poehl, of St. Petersburg, is of the opinion that the injection of spermine is of service in Asiatic cholera, particularly in the early stage of the disease.

The injections of an extract were followed by relief in cases of insomnia, hypochondria, feeble heart, cardiac asthma, and spinal irritation, as reported by Dr. H. C. Brainerd, of Cleveland. Dr. Stockwell believes the subject deserves further investigation.‡

## SPIGELIA (U. S. P.).—Spigelia, Pink-Root.

**Dose**, ʒi–ij, for an adult; gr. x–xv, for a child of 3 years.

### *Preparation.*

*Extractum Spigeliæ Fluidum* (U. S. P.).—Fluid Extract of Spigelia. *Dose*, fʒi–ij.

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* See paper by the author on "The Case of Dr. Brown-Séquard," *The Times and Register*, November 30, 1889.

† See lecture by Dr. D. Uspenski, on "Brown-Séquard Fluid in Tuberculosis," in *Deutsche Medizinal Zeitung*, December 29, 1890.

‡ "Historical, Critical, and Scientific Aspects of Brown-Séquard's Discovery—The So-called Elixir," *The Therapeutic Gazette*, vol. v, p. 819; vol. vi, p. 14.

**Pharmacology.**—Spigelia is named in honor of Adrien Spigelius, an Italian botanist of the seventeenth century. Medicinally it is the rhizome and rootlets of Spigelia marilandica (Loganiaceæ), growing in thickets from Pennsylvania to Illinois and southward. It has a scarpoid spike with funnel-shaped, sessile flowers, crimson externally and orange within, which appear in June. The roots contain a bitter principle, volatile oil, resin, etc., but which is the true active agent is not known.

**Physiological Action.**—Spigelia is a popular anthelmintic against round-worms. It has some cathartic action, but this is uncertain, and it is therefore usually administered with senna. When it does not produce purgation promptly, some symptoms of cerebral disorder, as vertigo, dimness of vision, strabismus, dilated pupils, even convulsions may appear. Therefore it is best to administer a dose of a saline, like magnesium sulphate, about two hours after taking spigelia. Moderate doses retard the pulse and diminish arterial pressure. Excessive amounts are capable of causing death.

**Therapy.**—This remedy ranks among the best of our agents for the destruction of lumbricoid worms.

The combined extracts of spigelia and senna (5 to 3), with aromatics, were formerly official, the dose being 1 or 2 fluidrachms. In this combination the narcotic effects are obviated. An objection to this remedy is its color, which stains the child's clothing if it should vomit or have loose passages.

The Spigelia anthelmia, in structural characteristics, resembles spigelia, but has insignificant, greenish-red flowers; the root is short and divided into long rootlets. It is an annual and a native of South America and the West Indies. Its constituents are unknown.

Full doses cause vomiting, diarrhœa, giddiness, stupor, dilated pupils, tremors, muscular contractions, convulsions, dyspnœa, and death. It is an acrid, narcotic poison. It has been employed as a vermifuge; and also in rheumatic affections of the heart and pericardium, and of the eye. In palpitation of the heart accompanying valvular disease, it has been used with asserted success in 10-minim doses of a tincture (12 per cent.).

## STAPHISAGRIA (U. S. P.).—Stavesacre.

**Dose,** gr. i–iij.

**Pharmacology.**—The seeds of Delphinium staphisagria (Ranunculaceæ), growing along the Mediterranean, contain several alkaloids, the most important being **Delphinine, Delphisine,** and **Delphinoidine.** They also contain a bland fixed oil, which, when extracted by ether, is apt to be contaminated by the alkaloids. There are no official preparations, but an ointment (20 per cent.) and a fluid extract are used.

**Physiological Action.**—Stavesacre is used principally for killing vermin. It is irritating to the skin, producing erythematous inflammation when locally applied; a narcotic poison when taken internally, lowering the action of the heart, causing profound depression of the vital power and spinal paralysis, with death from asphyxia. A fatal result has even attended its local application to the scalp, when used too freely in a child.

Charalampi (Inaug. Dissert. Dorpat) found that, although delphinine and delphisine have the same chemical composition, they differ slightly in their behavior to water, alcohol, ether, and benzol, but still more in their physiological effects. Delphinine has an acrid, benumbing taste, while delphisine is bitter, leaving a burning sensation on the tongue. Delphinoidine, which is amorphous, has a bitter, scarcely acrid taste, is soluble in ether, and yields amorphous salts, which are soluble in water. The mixture of principles insoluble in alcohol, which has been known hitherto as **Staphisagrine,** consists of at least four alkaloids, all of which are amorphous and have a bitter taste. The physiological action of the different alkaloids was determined by Professor Kobert. He found that they do not dilate the pupil; otherwise they resemble aconite, though decidedly weaker, differing among themselves in their effects. Delphinine shows a very close relation to aconitine. The lethal dose for cats is $\frac{1}{40}$ grain of delphinine or $\frac{1}{120}$ grain of delphisine; of delphinoidine the lethal dose was also $\frac{1}{120}$ grain, but it was more decidedly narcotic in its action.*

**Therapy.**—The use of stavesacre in medicine is restricted almost entirely to its effects as a parasiticide. The dry powder may be dusted over the effected surface, for head- or body-lice, or the following formula employed, which has been highly recommended:—

℞ Ext. staphisagriæ fl., . . . . . . . . . fʒij.
Acid. acetici dilut. (vel aceti), . . . . q. s. ad f℥vj.
M. Sig.: For pediculosis. If applied several times a day, usually effects a cure in two days.

The ointment may be used in scabies as a parasiticide, but its common employment is for the destruction of pediculi. Care should be taken not to apply it too freely, and to remove it at once upon the appearance of toxic symptoms. The oil has also been used for this purpose. Squire recommends the oil of stavesacre diluted with olive-oil. As suggested by Professor Leidy, any bland oil would answer the purpose, as lice are air-breathing insects, and are suffocated by being immersed in oil; poison is therefore unnecessary. An ointment consisting of 1 part of the oil of stavesacre to 7 parts of lard has been found efficacious in prurigo senilis. **Delphinine** has been employed in painful affections, as in neuralgia, where an ointment (gr. x–xx to ℥j) may be applied over the course of painful nerves. Given internally (gr. $\frac{1}{10}$ to $\frac{1}{8}$), it was found to act as a cardiac sedative and to relieve excitement in acute rheumatism by von Mering. It has also been used in asthma as an antipyretic in the same doses. A decoction of stavesacre-seeds has sometimes proved useful as an anthelmintic, and Phillips† has known the tincture apparently useful in long-standing amenorrhœa and also in the nausea of pregnancy. Dr. W. B. Squire, of Worthington, Ind., uses stavesacre in irritable bladder with painful micturition.

## STEARATES.

**Pharmacology.**—Stearic acid, prepared from suet, has been combined with copper, maganese, mercury, and zinc, forming powders which, in diseased conditions of the skin, can be used either in their own form or as ointments. Traces of other fatty acids are associated with the stearic acid.

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* *American Journal of Pharmacy*, August, 1890.

† *Op cit.*, p. 48.

**Therapy.**—The compound zinc stearate is a serviceable dusting-powder in intertrigo, hyperidrosis, and acute vesicular eczema. It is useful in allaying itching. A distinctive property of this body is that it adheres very closely to mucous surfaces and retains its position for hours, effectually preventing irritation by morbid discharges. This compound is employed as a vehicle for many other drugs. Mixed with boric acid, it is beneficial in bromidrosis, paræsthesia, ulcers, and eczema. The compound zinc stearate, mingled in various proportions with salicylic acid, is applicable to hyperidrosis, eczema rubrum, chancroids, and gangrenous wounds. The addition of tannic acid renders it advantageous in bed-sores and prolapsed bowel. With aristol it is serviceable in atrophic rhinitis and ozæna. Dr. N. F. Brown has used this compound with advantage in acne, rosacea and psoriasis, in vulvitis, vaginitis and inflammation of the neck of the womb.

The compound zinc stearate with balsam of Peru may be employed by insufflation in tuberculous ulcers of the larynx. A union with chrysarobin is a good application in psoriasis; with cocaine it may be applied to the nasal passages in acute coryza and hay fever; with tar it is advantageous in chronic eczema and psoriasis; with resorcin it is of utility in parasitic skin diseases and syphilitic ulcers. A combination of compound zinc stearate with acetanilid in the proportion of 15 grains of the latter to the drachm of the former substance is a useful application to suppurating wounds, to which it serves at the same time as a deodorizing agent.

Other active compounds of stearates have been prepared and placed upon the market by McKesson & Robbins, of New York. The compound mercury stearate is recommended for the relief of paræsthesia and as a substitute for other mercurial combinations. The compound manganese stearate is considered as preferable to the purified oxide.

**STERCULIA.** See Kola-Nut.

## STILLINGIA (U. S. P.).—Stillingia, Queen's Root.

*Preparations.*

*Extractum Stillingiæ Fluidum* (U. S. P.).—Fluid Extract of Stillingia. *Dose*, ♏x–fʒj.

*Extractum Stillingiæ Fluidum Compositum* (stillingia 130, corydalis 130, chimaphila 60, iris 60, sambucus 60, xanthoxylum-berries 30, and coriander 30, to make 500 parts fluid extract with dilute alcohol). *Dose*, fʒi–ij.

*Syrupus Stillingiæ Compositum.*—Compound Syrup of Stillingia (compound fluid extract 1 to simple syrup 3 parts). *Dose*, fʒj–℥j.

*Tinctura Stillingiæ.*—Tincture of Stillingia (10 per cent.). *Dose*, fʒss–j.

*Decoctum Stillingiæ.*—Decoction of Stillingia (1 to 16). *Dose*, f℥i–ij.

**Pharmacology.**—The root of Stillingia sylvatica (Euphorbiaceæ), an indigenous perennial, growing in the southern portion of the United States. The most noteworthy constituent is a soft resin, but it also contains a bitter, acrid principle and some volatile oil.

**Physiological Action.**—When taken in rather large doses, this drug acts as a severe cathartic and emetic. In small doses, frequently repeated, it is believed to stimulate various secretions so as to warrant its being considered alterative. It is also regarded as a stimulant to the heart and circulation.

**Therapy.**—Stillingia has been employed as an alterative in syphilis, scrofula, and liver disorders. In syphilis it is often combined with sarsaparilla. In jaundice, hæmorrhoids, constipation, and disordered digestion from insufficient action of the liver, stillingia is valuable.

It has likewise been recommended in the first stage of hepatic cirrhosis and in ascites due to that disorder. Intermittent fever being frequently associated with torpid or deranged liver, the combination of this drug with antiperiodic treatment is very successful. The compound fluid extract is a good vehicle and adjuvant for potassium iodide in syphilis, chronic rheumatism, etc. In various cachectic skin disorders also this combination is useful.

**STRAMONIUM.—Stramonium, Thorn-Apple.**

**Stramonii Folia** (U. S. P.).—**Stramonium Leaves. Dose,** gr. i–v.

**Stramonii Semen** (U. S. P.).—**Stramonium-Seed. Dose,** gr. ss–ij.

*Preparations from the Seed.*

*Extractum Stramonii Seminis* (U. S. P.).—Extract of Stramonium-seed. *Dose,* gr. ¼–½.

*Extractum Stramonii Seminis Fluidum* (U. S. P.)—Fluid Extract of Stramonium-seed. *Dose,* ♏i–v.

*Tinctura Stramonii Seminis* (U. S. P.).—Tincture of Stramonium-seed. *Dose,* ♏x–xx.

*Unguentum Stramonii* (U. S. P.).—Stramonium Ointment (extract, 10 per cent.).

*Daturina.*—Daturine. Identical with Atropine. *Dose,* gr. $\frac{1}{120}$.

**Pharmacology.**—The leaves and seed of Datura stramonium (Solanaceæ) are each official, but no preparations of the leaves are recognized by the present edition of the pharmacopœia on account of their variability in strength. The plant is an annual with green stem, coarse, rank-smelling leaves, and white flowers; the seed-capsule is green and fleshy. It grows wild in Europe and the United States, being commonly known here as Jamestown weed (Jimsun weed), or thorn-apple. The last name is unfortunate, for when the seeds are eaten by children poisoning occurs, sometimes with fatal results.* It contains an alkaloid, **Daturine** (0.02 to 0.03 per cent.), which appears to be chemically and physiologically the same as atropine of belladonna, but is said to be twice as strong (Oldberg and Wall).

**Physiological Action.**—The physiological properties of stramonium are the same as those of belladonna, except that the sympathetic nervous system is more influenced by stramonium, the heart becoming irregular and more delirium being manifested under its use. It is held to be aphrodisiac in full doses. Stramonium is eliminated from the system by the kidneys. The toxic effects are not very different and the treatment is the same as for belladonna poisoning. (See Belladonna.) Stramonium will frequently give rise to a scarlatiniform eruption.

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* Pellicini (*Il Progresso Medico*) reports five cases of poisoning in one family owing to the use of a decoction for a cough. The patients recovered under the use of caffeine, morphine, black coffee and camphor.

**Therapy.**—The leaves of stramonium are sometimes used locally, in a poultice or fermentation, as an anodyne for engorged breasts, tumors, rheumatic joints, sprains, etc. The ointment is used for irritable ulcers, cancer, hæmorrhoids, fissures, and painful affections, especially around the anus. It is much better if made from the extract of the fresh leaves. When dried, they may be mixed with tobacco and smoked for asthma, the fumes being inhaled so as to enter the bronchial tubes, an attack being checked or materially alleviated in this manner. Some relief may be afforded, in the same way, in a case of biliary colic and the passage of a stone along the ureter, or gravel. About 15 grains may be mixed with an equal quantity, or more, of tobacco and smoked in a pipe, or made into a pastille, with a little nitre, and moistened with alcohol, or burned on a hot shovel in a close room. Stramonium has likewise been administered internally in asthma with some success, but its action is much more uncertain when taken by the mouth than when inhaled.

In mania of acute character, puerperal or other, the tincture should be given in decided doses, every two to four hours, until physiological symptoms are manifested. In spasmodic neuralgia (tic douloureux) and various forms of visceral neurosis, dysmenorrhœa, etc., stramonium may be combined with other agents of the same group, or with opium.

In spasmodic cough, the tincture might be used as a substitute for belladonna, in small doses. Stramonium is sometimes given with advantage in chorea, epilepsy, and nymphomania. The remedy seems especially beneficial when the last-named affection is associated with depressed spirits. Chronic rheumatism is not infrequently benefited by the internal use of stramonium.

## STRONTIUM.—Strontium.

### *Preparations.*

*Strontii Bromidum* (U. S . P.).—Strontium Bromide. *Dose*, gr. x–xx.
*Strontii Iodidum* (U. S. P.).—Strontium Iodide. *Dose*, gr. x–xx.
*Strontii Lactas* (U. S. P.).—Strontium Lactate. *Dose*, gr. x–xx.

**Pharmacology.**—Strontium combines freely with other elements, forming a long list of salts. The bromide, iodide, and lactate are freely soluble in water; the phosphate is insoluble.

**Physiological Action.**—The effects of strontium were but little known until the investigations of Dr. J. V. Laborde, who reported his results to the Academy of Medicine, at the meetings of July 21 and 28, 1891. His experiments were made upon dogs and, in one instance, upon the human subject. He found that large proportionate doses of bromide, chloride, carbonate, and lactate of strontium could be administered without producing any deleterious effects. The lactate gave rise, in the dog, to marked diuresis. M. Ch. Féré, in an independent investigation relative to the comparative toxicity of the bromides when given by intra-venous injection, ascertained that, in the rabbit, the potassium bromide is about five times as toxic as the strontium bromide. Strontium increases the appetite, digestion, and assimilation of animals. Its salts retard fermentation and putrefaction, and act as intestinal antiseptics. Laborde attributes to them an anthelmintic effect. The combinations of strontium are partially eliminated in the urine and fæces, but a portion is retained within the economy and deposited in the bones, liver, and, to a less extent, in the soft tissues.

**Therapy.**—Strontium bromide has been used with satisfactory results in epilepsy. It is well borne by the stomach, and has not as yet been productive of any of the phenomena of bromism. The paroxysms of hystero-epilepsy have also been controlled by this salt.

In true epilepsy it is perhaps more efficacious tnan potassium bromide in diminishing the frequency of paroxysms. According to the experience of Dr. Berkley, the improved mental condition, lessened somnolence and excitability under the use of the strontium salt should lead us to prefer it to the other bromides.

The digestive disturbances accompanying disease of the heart and kidneys are notably ameliorated by strontium bromide. The writer has witnessed marked relief follow its administration in nervous dyspepsia and gastralgia. In dyspepsia associated with excess of hydrochloric acid, strontium bromide produces rapid and decided relief. It has proved efficacious in cases where the acid was deficient. In nervous vomiting and dilatation of the stomach it is also beneficial. In acute catarrh of the stomach it has been found to control vomiting and allay pain. The writer observed improvement follow the use of the bromide in chorea. This salt also afforded signal relief in senile pruritus. Germain Sée, in albuminuria, administers with good effect strontium bromide and calcium bromide alternately, in doses of 60 to 75 grains in the course of the day.

Strontium bromide should not be administered in combination with sodium bicarbonate, as a double reaction takes place between the salts.

Strontium lactate is of decided service in albuminuria. It generally causes a rapid reduction of the albumin, but its administration should not be too soon suspended. Strontium is not a positive diuretic in man, though in several cases the writer has seen a pronounced diuretic effect from the use of the lactate. The lactate is efficacious in scrofulous, gouty, and rheumatic nephritis, in the albuminuria of pregnant and puerperal women, and in that of cardiac origin, but is of no service after the manifestation of uræmia. Strontium lactate is of utility in subacute or chronic gout and rheumatism. In eczema dependent upon Bright's disease and psoriasis due to a rheumatic diathesis, strontium lactate effects improvement. It is advantageous in chronic gastric and intestinal catarrh.

Dr. A. Ried believes that the diuretic power of this salt is sufficient to constitute a valuable temporary substitute for the salicylates in the treatment of pleuritic exudations.

Strontium iodide is much better tolerated than potassium iodide, and is not apt to give rise to gastric irritability or eruption upon the skin. This salt is an excellent remedy in certain constitutional disorders. It is valuable in the treatment of enlarged lymphatic glands, scrofuloderma, chronic abscesses, disease of bones and joints, in scrofulous otorrhœa, ozæna, or ophthalmia. Lichen scrofulosum, strumous acne and eczema, and other affections of the skin occurring in scrofulous subjects, are improved by the administration of strontium iodide. It is likewise beneficial in chronic eczema with excessive infiltration and thickening of the skin. It is a good systemic remedy in lupus vulgaris and in the early stage of tuberculosis.

Rheumatic manifestations often yield promptly to strontium iodide. It is of particular service in chronic, subacute, and muscular rheumatism. Sciatica and trifacial neuralgia dependent upon a rheumatic basis will often yield to this remedy. It is likewise of avail in chronic and subacute gout. Eczema, erythema multiforme, erythema nodosum, purpura rheumatica, psoriasis, and paræsthesia, caused by gout or rheumatism, are benefited by the use of this salt. The writer has seen good results from its employment in large pustules of the scalp, tubercular syphilide, and in all the later manifestations of syphilis. Strontium iodide is useful in chronic bronchitis, asthma, chronic catarrhal pneumonia, and chronic pleurisy. It will probably be found of avail in the first stage of cirrhosis of the liver or kidney. It is useful in chronic lead or mercurial poisoning. It may be employed in aortic aneurism, and Germain Sée recommends it in various affections of the heart. Experience has shown it to be useful in arterio-sclerosis and angina pectoris. MM. Laborde and Malbec conclude that strontium iodide has a manifest influence upon the heart and is of service in affections of the myocardium, lesions of the aortic orifice and the arteries. This salt can be safely given in comparatively large doses, and is well adapted to take the place of potassium iodide whenever the latter compound is not well borne.

Strontium nitrate, in 30-grain doses, has been advantageously used in articular rheumatism. Laborde regards strontium phosphate as an excellent nutritive and tonic agent. Strontium acetate is said to be an efficient tæniacide, given in a 15-per-cent. solution in water and glycerin, the dose being two tablespoonfuls daily for five consecutive days.

Strontium salicylate has been employed in flatulent dyspepsia and in various conditions of intestinal fermentation, in muscular and subacute rheumatism and chronic gouty manifestations accompanied by digestive disturbance. It is said to be well borne and to improve digestion. This salt is given in doses of 5 to 10 grains after meals and is best administered in capsules.

## STROPHANTHUS (U. S. P.).—Strophanthus.

### *Preparation.*

*Tinctura Strophanthi* (U. S. P.).—Tincture of Strophanthus (5 per cent.). *Dose*, ♏ii–xv.

**Pharmacology.**—The Strophanthus hispidus (Apocynaceæ) is a climbing plant of western Africa, from which the natives make a toxic extract known as the Kombé arrow-poison. There are several varieties of strophanthus, but the above is believed by Kirk to be the one used in medicine. Important communications relative to the different varieties of hispidus and their distinctive alkaloids were made by M. Gley to the Biological Society of Paris, at the sessions of November 8, 1889, and

February 22, 1890.* According to M. Gley, while strophanthus hispidus is used by the natives of the western coast of Africa, the Somalis of the eastern coast, for similar purposes, make use of the juice of another species. Products brought from these two different parts of the African coast by M. Arnaud, of the Museum, yielded upon examination the same active principle, which is termed **ouabaïne.** In South Africa is found a third Apocynum, Strophanthus Kombé, the seeds of which yield a second principle, **strophanthin.** M. Arnaud states that the chemical composition of strophanthine is very analogous to that of ouabaïne. The substance isolated by Arnaud is regarded as the only genuine strophanthin. Ouabaïne is a transparent, white, crystalline powder, slightly bitter; soluble with difficulty in cold water, but readily soluble in hot water; insoluble in chloroform and ether.

The active principle is **Strophanthin,** from which **Strophanthidin** may be derived by the action of sulphuric acid. Strophanthin is a crystallizable glucoside present in different parts of the plant, but especially in large proportion in the seeds (8 to 10 per cent.). It is bitter, acidulous, insoluble in ether and chloroform, but soluble in alcohol and in water. A good fluid extract would probably be the best preparation, but the effects of the tincture have been most observed by Professor Fraser,† of Edinburgh, who first introduced it to the profession in 1870. The active principle may be administered simply dissolved in water (gr. i–f℥j), the dose being gr. $\frac{1}{100}$ to $\frac{1}{60}$ (or 5 to 8 minims of the solution). Bartholow advises chloroform-water as a solvent, in order to prevent the formation of penicillium.

**Physiological Action.**—Strophanthus has no local action, apart from the observation of Steinbach that the seeds caused anæsthesia when applied to the cornea. This local action has been studied by Gley and is common to both ouabaïne and strophanthin, but is more decided in the former substance. Three or four drops of a solution of 1 to 1000 dropped into the cornea anæsthetize it for a considerable time, which may extend to several hours. The effects are unaccompanied by any irritation of the conjunctiva. Strophanthin and ouabaïne are much more powerful local anæsthetics than cocaine, and the anæsthesia which they produce is total, including all varieties of sensibility. The feeling of heat and cold is the last to be extinguished and the first to revive. The drug, however, causes passive hyperæmia and may give rise to cloudiness of the cornea.

Strophanthus is bitter, and promotes appetite and digestion, if given in small doses. Its principal use is as a cardiac tonic, resembling digitalis. It slows the heart-beat, lengthens the intervals between the contractions, and increases the energy of the muscular tissue. Some effect is also seen upon the arteries, but the rise of blood-pressure is due principally to the increased force of the cardiac contractions. In fatal cases the heart's action is arrested in diastole. It has some diuretic power and it is claimed has no cumulative effect, but, as pointed out by Bartholow, this must depend upon the interval between the doses, for if they are given too frequently the effects must overlap each other. The action of ouabaïne and strophanthin upon the heart is identical. The prolonged use of strophanthus sometimes gives rise to diarrhœa. In animals poisoned by strophanthus there is found marked evidence of irritation of the gastro-intestinal tract with irritation or inflammation of the kidneys.

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* *Le Progrès Medical,* November 16, 1889, and March 1, 1890; *Medical Bulletin,* March, 1890, p. 92, and June, 1890, p. 218.

† *British Medical Journal,* January 22, 1887, and Transactions of the Royal Society of Edinburgh, vol. xxxv, part iv (No. 21), 1890.

**Therapy.**—Strophanthin has been employed as a local anæsthetic, administered percutaneously by means of cataphoresis, the anode being moistened with the solution, or a tissue-paper disk used containing $\frac{1}{250}$ train or more and a current of 5 to 8 milliampères employed.* It is in cases of mitral disease not compensated where digitalis is not well borne, or in intervals of digitalis treatment, that strophanthus has been particularly praised. It lessens the ischæmia of the arteries and increases the rate of blood-current to the veins; but, unlike digitalis, it does not materially affect the calibre of the arteries, and consequently does not so much increase the work of the heart by contracting them. Strophanthus is especially useful in the progressive heart-failure of elderly patients, with attacks of dyspnœa simulating angina. Strophanthus is a serviceable cardiac stimulant in typhoid fever, and some authorities advocate its employment in angina pectoris. Cardiac dropsy is relieved by it. It can be prescribed thus:—

℞ Tinct. strophanthi,
Tinct. nucis vomicæ,
Tinct. cardamomi, . . . . . . . . . āā fʒj.
Aquæ menth. pip., . . . . . . . . q. s. ad f℥v.
M. Sig.: A teaspoonful or two every two or three hours.

Professor James M. Anders, of Philadelphia, regards strophanthus as of particular value in irregular action of the heart, and believes that its efficacy in this condition is enhanced by a combination with digitalis.

In the treatment of psoriasis, the author has had some good results, especially when the integument is much congested, from strophanthus, with hoang-nan:—

℞ Tinct. strophanthi,
Ext. hoang-nan fl., . . . . . . . . . āā fʒij.
M. Sig.: Ten to twenty drops in water three times a day.

Strophanthus is of advantage in bronchial asthma and whooping-cough. Dr. William Gemmel, of Glasgow, has made use of ouabaïne in 49 cases of whooping-cough.† He found it, when cautiously employed, to be of notable benefit in all stages of the disease. It is destitute of cumulative action. In an uncomplicated case it reduces the pulse temperature, and respiration a little below the normal. Ouabaïne increased the activity of the skin. The bowels were unaffected. The excretion of urine was slightly increased. The appetite and the general condition were considerably improved. Sleep was sound while ouabaïne was being administered. This substance was given in very small doses.

Dr. Gemmell states that the dose of ouabaïne, to begin with, should not exceed $\frac{1}{1000}$ grain every three hours ($\frac{1}{125}$ grain daily). For children under one year of age, not more than $\frac{1}{2000}$ grain should be given every three hours. From the sixth to the twelfth year, if the symptoms are severe, $\frac{1}{500}$ grain may be given in each dose, but the action must be carefully watched. Ouabaïne may be administered alone, dissolved in water, or in combination with potassium bromide or chloral hydrate. The simplest way is to dissolve one grain of ouabaïne in distilled water, so that each minim of the solution shall be equal to $\frac{1}{1000}$ grain of ouabaïne. Thus:—

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* "Fortschritte der Medizin," February 1, 1890. Also see article Frederick Peterson, M.D., on "A Farther Study of Anodal Diffusion as a Therapeutic Agent," *Medical Record*, New York, January 31, 1891.

† *British Medical Journal*, April 26, 1890, p. 950.

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|---|---|
| ℞ Liq. ouabaïn., | ♏xlviij. |
| Syr. aurantii, | fʒiv. |
| Aquæ, q. s. ad | f℥vj. |

M. Sig.: A teaspoonful, every three hours.

Rothziegel[*] recommends strophanthin in the treatment of respiratory diseases, according to the following formula:—

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|---|---|
| ℞ Strophanthini, | gr. $\frac{1}{20}$ vel $\frac{1}{12}$. |
| Aquæ destillatæ, | fʒiiss. |

M. Sig.: Ten to twenty drops, in capsules, every two hours.

The active principle of strophanthus may be administered hypodermically, in doses of gr. $\frac{1}{100}$, not more than once daily. The hypodermic injections are useful in chills, due to urethral shock, following passage of a sound or an operation; also in malarial or nervous chills. In Bright's disease, the symptoms of uræmia and dyspnœal attacks are rapidly relieved by strophanthus, which also reduces the dropsy of chronic kidney disorder. For exophthalmus, with irregular overaction of the heart (Graves's disease), it has been successfully tried. Dr. E. D. Ferguson[†] says that in eight cases out of nine, to which he gave strophanthus in exophthalmic goitre, there was marked relief; the other one had pre-existing pulmonary disease. He thinks it a probable explanation that strophanthus relieves the overtaxed heart by overcoming resistance in the systemic circulation. He advises beginning with doses of ♏viij, and gradually increasing them to ♏xxv, of a good tincture, several times daily.

Dr. Wm. A. Hammond, in an article in the *Therapeutic Gazette*,[‡] on "Weak Heart and its Treatment," considers strophanthus a valuable remedy, though inferior to digitalis, and states that it appears to him ' to bear the same relation to digitalis that brucine does to strychnine, and when administered with a view to its tonic effect upon the heart it should be given in much larger doses than those ordinarily prescribed." Hare suggests its use in children, where digitalis does not answer well; but Demme holds the view that in children more care is needed in using strophanthus than in using digitalis,[§] stating that the toxic effect of strophanthus on the heart-muscle often occurs unexpectedly and more suddenly than with digitalis. In the case of very young children, Demme observed strophanthus to cause indigestion. If it cause nausea and cold-sweating, it should be withdrawn and coffee and brandy be administered. On the other hand, Moncorvo, of Rio Janeiro, also an excellent observer, values strophanthus as a cardiac stimulant and diuretic in the diseases of children. He considers it prompt and energetic, but devoid of danger, and claims that its good effects last long after the cessation of its administration.

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[*] *L'Union Médicale*, No. 140, 1890.

[†] Proceedings N. Y. Medical Association, October 22, 1890; *Medical Record*, November 1, p. 592.

[‡] Oct. 15, 1890, p. 668.

[§] Annual of the Universal Medical Sciences for 1890, vol. v, p. A-126.

**STRYCHNINE** (U. S. P.).—**Strychnine.** (See Nux Vomica.)

**STYRAX** (U. S. P.).—**Storax, Liquid Storax.**

**Dose,** gr. v–xx.

**Pharmacology.**—The inner bark of the Liquidambar orientalis (Hamamelaceæ), growing in Asia Minor, or Oriental sweet gum, yields styrax, which is a true **balsam,** containing a volatile oil, **Styrol, Cinnamic acid, Styracin,** and other cinnamic ethers, two resins, etc. It enters into the compound tincture of benzoin (8 per cent.).

**Physiological Action.**—It is stimulant and expectorant.

**Therapy.**—Mixed with olive-oil, equal parts, storax is used in treating scabies, and in some cutaneous diseases requiring slight stimulation. Storax is a good application to foul ulcers, and, made into an ointment, is an excellent dressing to the ulcers of frost-bite. It is a stimulating expectorant in chronic bronchitis, generally used, however, in combination, both internally administered and by inhalation, the tincture being volatilized by hot water. Storax has also been brought forward as a remedy for gonorrhœa and gleet, also for chronic catarrhal affections of the genito-urinary organs, and it has been found useful in amenorrhœa. **Styrone,** a derivative of styracin, which is resolved by caustic potash into a cinnamate and cinnamic alcohol or styrone, is a very efficient antiseptic, and its use has been enthusiastically advocated by its introducer, Dr. H. H. A. Beach,* who based his observations upon numerous surgical cases treated by him in the wards of the Massachusetts General Hospital.

It is a prompt deodorizer of foul wounds or ulcers,—malignant or not,—and in bronchial catarrh it can be used in a spray:—

℞ Styron., . . . . . . . . . . . . ʒj.
Glycerini,
Aquæ destillatæ, . . . . . . . . . . āā f℥j.
M. For external application.

Being non-poisonous, styrone can be used in emulsion with olive-oil or water for injecting into cavities, as after the operation for empyema; and, having an agreeable, cinnamon-like odor, it has been utilized in dentistry. Various combinations of styrone are suggested, as with liquid petrolatum, 1 to 12, which was used with success upon the dressings as an antiseptic, after removal of the female breast.

Dr. Beach suggests the internal use of styrone in treatment of cholera for the disinfection of the alimentary canal. It may also be substituted for carbolic acid in gargles, requiring antiseptic action, and probably would be a useful enema for oxyurides, or ulceration of the rectum. A solution of 1 to 60, containing a small amount of glycerin, would be well suited for internal use. Styrone is likewise an excellent deodorant and disinfectant in cases of purulent inflammation of the ear.

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* "Styrone: A Consideration of its Value as an Antiseptic," by H. H. A. Beach, M.D., *Boston Medical and Surgical Journal*, August 1 and 8, 1889.

## SUCCINUM.—Amber.

### *Preparation.*

*Oleum Succini.*—Oil of Amber (a volatile oil obtained by the destructive distillation of amber and purified by subsequent rectification). *Dose,* ♏v–xx.

**Pharmacology.**—Amber is a resin found among fossil alluvial deposits in different parts of the world, representing the resinous exudation of a number of varieties of extinct coniferous trees. The amber consumed in this country is brought from the ports of the Baltic, but it has been found in small quantities in New Jersey and Maryland. It is a light-yellow, brittle solid, in irregular masses, resembling colophony. Water and alcohol scarcely act on it. It becomes negatively electrified by friction. By distillation, oil of amber and succinic acid are obtained, and by repeated distillations from nitric acid it yields a liquor from which ether separates pure camphor. Amber consists of a volatile oil, a yellow resin, another resin, succinic acid, and a bituminous principle, the latter constituting about 80 per cent. It also contains a yellow coloring matter. The oil of amber is largely adulterated, and has fallen almost completely into disuse.

**Physiological Action.**—The rectified oil of amber is stimulant and antispasmodic, and excites the secretions of the bronchial mucous membrane and kidneys. Locally it is counter-irritant.

**Therapy.**—The volatile oil of amber has been used as a counter-irritant to the chest in cases of whooping-cough.

As an external application in croupous pneumonia, Dr. John A. Larrabee employs:—

℞ Ol. succini rectificat., . . . . . . . . . f℥ss.
Ol. caryophylli, . . . . . . . . . . ♏xx.
Liniment. saponis, . . . . . . . . . . f℥iiss.
M.

Oil of amber has also been applied to the back, along the spine, for certain spasmodic affections, such as chorea and infantile convulsions. Dr. H. S. Purdon treats acne with good results by rubbing the affected part at night with the oil of amber and washing it off next morning with hot water and soap. It is a useful ingredient, in liniment, for chronic rheumatism, though probably inferior to oil of turpentine. It has also been used as an embrocation in chronic bronchitis.

Internally it has been given for amenorrhœa, digestive disorders, with pain, but is rarely prescribed at present. Flatulent dyspepsia may be relieved by the use of this remedy.

The oil of amber has likewise been found of avail in spasmodic affections, as hysteria, hiccough, and whooping-cough, and asthma.

In hiccough, Dr. J. W. Allen, of London, prescribes:—

℞ Ol. succini, . . . . . . . . . . . fʒss.
Liq. potassæ, . . . . . . . . . . . fʒj.
Tr. opii camph., . . . . . . . . . . f℥ss.
Mist. acac., . . . . . . . . . . . fʒij.
Aq. menth. pip., . . . . . . . . q. s. ad f℥vj.
M. Sig.: Two tablespoonfuls every two hours.

## SULPHAMINOL.—Thio-oxy-di-phenyl-amine.

**Pharmacology.**—When salts of oxydiphenylamine, dissolved in water, are exposed to the action of sulphur, a yellow powder is precipitated, which is without taste, odorless, readily dissolves in alkaline solutions; and in alcohol, with acetic acid, it forms yellow salts. In contact with animal liquids, sulphaminol, like salol, is split up into its components, forming nascent sulphur and phenol.

**Physiological Action.**—From its nature it is inferred that it is an active intestinal and systemic disinfectant. It is excreted by the urine, being converted again into oxydiphenylamine. Prof. Kobert found that in animals it is comparatively innocuous, even in doses of more than 7½ grains for each pound of body-weight. He also declares it to be without poisonous properties when administered in the human subject.

**Therapy.**—Sulphaminol has been tested as a disinfectant by Dr. Schmidt, of Frankfort, in laryngological practice, and found to be a good deodorizer, as well as antiseptic. It favors the repair of wounds and is said to be of special value in the after-treatment of operations upon the nose. Clinical observations in other fields of practice are wanting. It should be a good intestinal disinfectant in cholera Asiatica and summer cholera; also in typhoid fever, dysentery, diarrhœa, infectious dyspepsia, etc.

**SULPHONAL.—Di-ethyl-sulphon-di-methyl-methane.**

**Dose**, gr. xv–xl.

**Pharmacology.**—This is a synthetical compound, first manufactured in Germany, by Baumann, and is a quasi-proprietary preparation, as usually sold. It is a whitish, crystalline solid, without odor or taste, soluble in 100 parts of cold water and in 18 or 20 parts of hot water. It is generally administered in hot broth, coffee, or milk. The insolubility and slow rate of absorption of this substance, particularly when given in capsules or suspended in a mucilage, is accountable, in the opinion of Dr. D. D. Stewart, for much disappointment in the use of the drug, which he esteems as the most satisfactory of the newer hypnotics.* He suggests that at bed-time the sulphonal be completely dissolved in boiling water, and drunk as soon as it has been cooled to a temperature which can be borne. At this point not the slightest precipitation occurs. The solution, if desired, may be flavored with some such *liqueur* as *crême de menthe* ("green-mint cordial"). Sulphonal is soluble in alcohol, ether and chloroform.

**Physiological Action.**—Sulphonal is a hypnotic. The committee, of which Dr. T. Lauder Brunton was chairman, appointed by the British Medical Association to determine the relative value of the different hypnotics, especially with regard to the certainty of their action and question of tolerance, reported† that sulphonal was an efficient hypnotic in doses of 10 to 20 grains, given at night, and that it was generally well borne, and its effects were not lost during periods of several months. In a case of chronic gout, 30 grains produced no effect. In 6 out of 10 cases, in which 20 grains had been given, disagreeable after-effects were noted; drowsiness the following day was observed six times, giddiness four times, and headache and inco-ordination of gait, each twice. In

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* *Journal American Medical Association*, February 21, 1891.

† *British Medical Journal*, July 26, 1890; *Therapeutic Gazette*, October, 1890, p. 623.

7 cases, with 30 to 60 grains, drowsiness was noted four times, giddiness twice, headache twice, inco-ordination of gait and vomiting, each once. Several cases showed that a second dose on the succeeding night (20 grains) has a greater effect than on the first night. In some cases, prolonged use of the drug seems to diminish its effects. Thus, in a case (asthma and bronchitis) 20 grains were given every other night for eight weeks. During the first fortnight, sleep came on in an hour and lasted twelve hours each night. The drug was then omitted for a week, when the insomnia returned. In the succeeding five weeks the drug, after three hours, produced six hours' sleep. In a case of phthisis, 20 grains were given every other night for twenty-six days, except for five days, when the dose was reduced to 5 grains, but afterward was increased. During the time the patient was taking 20 grains, after an hour he slept for six hours. The drug was omitted for a fortnight, and, on recommencing it, only drowsiness and no sleep followed. In a case of neurasthenia with insomnia, quoted by Mr. Priestly, sulphonal, 10 to 20 grains, did not lose its effect during six months.

Smith, of London, finds that while under the influence of the drug the amount of urea and the quantity of urine are each slightly increased, but no evidence of marked destructive action upon nitrogenous tissues exists. According to Mackenzie, the phosphates in the urine are increased by small and diminished by large doses of sulphonal.

In moderate doses, the drug is completely changed during its passage through the body into a sulphuretted organic substance. Dr. Wm. F. Shirk, of Easton, Pa., finds that sulphonal acts especially upon the higher nerve-centres. It produces relaxation of the muscles and a staggering gait. Motor nerves are unaffected. Little, if any effect was exerted upon the circulation or the composition of the blood; upon the respiration the drug is depressant. Dr. Crozer Griffith reports a number of cases where the after-effects were more or less severe.* As a result of a review of the literature of the subject and 18 cases of his own, he concludes that the chief disadvantages of sulphonal are: (1) Its hypnotic action usually develops very slowly. (2) This action is very liable to be prolonged throughout a greater or lesser part of the following day. (3) It is difficult to determine the dose which may be given with effect and with comfort in each individual case, and this dose may vary at different times in the same case. (4) The drug is liable to produce unpleasant secondary effects, which may even replace the primary hypnotic action; chief among these are mental excitement, nausea, vomiting, dizziness, headache, languor, exhaustion, depression, and a staggering gait; these symptoms may appear after large or after quite small doses. (5) It very often fails to exert any hypnotic action, either in any dose whatever or in any amount which can be given with comfort to the patient. It sometimes produces a scarlet eruption upon the skin, as noted by Engelmann. The rash is, in some instances, characterized by severe itching. In other cases a general pruritus has been caused without any eruption. Dr. Hugh R. Beevor advises caution in the use of sulphonal, and believes that it may exert a deleterious influence upon the composition of the blood. In several cases which have been reported, the presence of hæmatoporphyrin in the urine has seemed to depend upon the prior administration of sulphonal. When given daily for a considerable period, sulphonal slowly accumulates in the body and appears in perceptible amounts in the urine. After the drug is discontinued it completely disappears from the system in the course of two or three days.

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* *Therapeutic Gazette*, May, 1890.

Dr. Knaggs* reports a fatal result on the third day, in spite of treatment. The patient, after taking an ounce of sulphonal, fell into a stupor; pulse and respiration were slow, temperature a little elevated (100° to 103°), and there was general and complete anæsthesia. Death resulted from failure of the respiration. Dr. T. H. Dillingham† reports a case of recovery, after taking 90 grains, in an elderly lady; stupor; with stertorous respiration, pulse slow, muscular inco-ordination, ptosis, slight facial palsy, dysuria, no albuminuria. Patient recovered gradually in about two weeks. Dr. R. R. Pettit reports a case of death from failure of respiration of a woman, after taking 30 grains. She was suffering from melancholia, with hysterical manifestations.

Symptoms produced by acute sulphonal intoxication are nausea, vomiting, muscular tremor, rigors, paresis of the lower extremities, cutaneous eruptions, disorders of vision and weakened respiratory movements. The urine assumes a port-wine color. After death, Stern found extensive necrosis of renal epithelium together with minute hæmorrhages due to toxic nephritis caused by the drug. On this account extreme caution must be used in administering sulphonal when the kidneys are diseased. The reddish-brown color of the urine is due to the presence of hæmatoporphyrin, but it is uncertain whether or not this substance circulates in the blood. In a case of death from sulphonal, Helweg found the cells of the anterior and posterior horns of the spinal column degenerated and their number diminished.

After poisoning, a trace of albumin and a few casts appear in the urine. Most of the sulphonal is eliminated in the form of free soluble ununited sulphuric acid, but a small amount of unchanged sulphonal may be found in the urine. A condition of "sulphonalism" has sometimes been noticed after prolonged administration of this drug. It manifests itself, according to Dr. Vorster, in two stages, motor-depressant and sensory depressant. The latter stage is attended by danger on account of the cardiac weakness which is present. This writer, who has used sulphonal largely in the insane asylum at Königslutter, has never witnessed any ill effects on discontinuing the remedy after its daily employment for weeks and months. In order to avoid the occurrence of chronic poisoning, Evensen suggests the advisability of alternating sulphonal from time to time with some other hypnotic remedy.

**Therapy.**—From the preceding summary, the theurapeutic applications of sulphonal may be readily inferred. It has been given successfully in nervous insomnia and in insanity. Dr. Vorster considers sulphonal peculiarly beneficial in acute mania or melancholia, promoting sleep by night and quiet by day. Sulphonal is of value in the treatment of delirium tremens and the wakefulness so common in cases of addiction to opium. Dr. William H. Flint considers it a safe and reliable hypnotic, but not an analgesic. It has been introduced into the British Pharmacopœia, so that it may be regarded as possessing established value as a somnifacient. A very good review of its therapeutic applications is contained in the "Annual of the Universal Medical Sciences for 1890," by Drs. Griffith and Cattell. Boettrich asserts that 7½ grains of sulphonal are generally successful in the prevention of night-sweats. He thinks that the effects of sulphonal equal those of atropine, and finds the former to retain its power, the sweating being decidedly less the night after a dose has been taken.* Jeffries reports (*Weekly Medical Review*) chorea much improved by the conjoined use of sulphonal and arsenic. He regards sulphonal as a valuable adjuvant to arsenic in the treatment of this disease. The paroxysm of asthma has been promptly relieved by the administration of 15 grains of sulphonal. Dr. J. H. Mackay, of Madison, Neb., has used sulphonal with advantage in insomnia due to influenza and alcoholism, and Dr. Julius Althaus found it beneficial in relieving the psychoses, accompanied by insomnia, which occurred as sequelæ of influenza. Dr. Edmund Andrews, of Chicago, states that the antispasmodic power of this remedy is of more value than its hypnotic influence. He has found it of great benefit in arresting the muscular spasms of fractured limbs. It is useful also in relieving the cramps of pregnant women. Sulphonal has been used with success in cases of nocturnal emissions due to spasm of the ejaculatory muscles.

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* *British Medical Journal*, October 25, 1890.

† *Medical Record*, December 13, 1890.

Dr. Julius Berenyi has reported a case of trismus neonatorum in which sulphonal was successfully employed. The remedy was administered in the dose of 3 grains in an enema and also given by the mouth. On the sixth day of treatment the paroxysms had completely disappeared. Altogether 150 grains were employed without the occurrence of somnolence or disagreeable after-effects. Sulphonal is of value in the treatment of the insane, especially in acute cases of excitement or mania. In certain instances its efficacy may be enhanced by combining it with opium.

It serves a useful purpose in quieting the irritability due to teething, preventing convulsions and producing peaceful sleep. Sulphonal is beneficial in epilepsy. This remedy alleviates obstinate hiccough and has been recommended as a preventive to sea-sickness. Dr. A. J. C. Skene has successfully employed sulphonal as a hypnotic after laparotomies, and it may be given with the same object after other surgical operations, provided that severe pain is not present.

Casarelli has made use of sulphonal in the treatment of diabetes, upon which he observed this drug to have a favorable influence, gradually lessening the quantity of sugar. The amelioration is evident after the remedy has been used for several days in dose of 15 to 30 grains per diem. In the dose of 45 grains, long continued, it produced a condition of lethargy and sometimes delirium. But if intermitted for a day, or if the dose be diminished, these manifestations cease. If the drug be abondoned the sugar soon reappears.†

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* *Therap. Monatshefte*, March, 1890; *American Practitioner and News*, January 31, 1891.

† *Annales de Thérapeutique Medico-Chirurgicale*, September, 1890.

## SULPHUR.—Sulphur, Brimstone.

### *Forms and Preparations.*

*Sulphur Sublimatum* (U. S. P.).—Sublimed Sulphur, Flowers of Sulphur. *Dose*, gr. xx–ʒj.

*Sulphur Lotum* (U. S. P.).—Washed Sulphur (sublimed sulphur thoroughly washed with water). *Dose*, ʒss–℥ss.

*Sulphur Præcipitatum* (U. S. P.).—Precipitated Sulphur (sublimed sulphur treated with lime, hydrochloric acid, and boiling water). The preferred form for internal administration. *Dose*, gr. xxx–ʒij.

*Sulphuris Iodidum* (U. S. P.).—Sulphur Iodide. *Dose*, gr. ss–j.

*Unguentum Sulphuris* (U. S. P.).—Sulphur Ointment (washed sulphur 30, benzoinated lard 70 parts).

*Unguentum Sulphuris Alkalinum.*—Alkaline Sulphur Ointment (washed sulphur 20, potassium carbonate 10, water 5, benzoinated lard 65 parts).

*Pulvis Glycyrrhizæ Compositus* (U. S. P.).—Compound Powder of Glycyrrhiza (contains washed sulphur 8 per cent.).

The sulphite, bisulphite and hyposulphite of sodium are official. Sodium sulphocarbolate is also official.

The recognized *sulphides* are *Calx Sulphurata* (U. S. P.), commonly misnamed sulphide of calcium (consisting chiefly of calcium sulphide and calcium sulphate, in varying proportions); *Antimonii Sulphidum* (U. S. P.); *Antimonii Sulphidum Purificatum* (U. S. P.); and *Potassa Sulphurata* (U. S. P.).

*Oil of Sulphur* is the popular name of a preparation made by boiling olive-oil 8 parts and 1 part of sublimed sulphur together in an iron pot until a uniform mixture is obtained; according to the old Edinburgh Pharmacopœia, it was also known as balsam of sulphur. The oil is partly decomposed, and the resulting preparation has an extremely fetid odor and acrid taste. The German Pharmacopœia has a similar preparation, made with linseed- instead of olive-oil.*

*Spirit of Sulphur*, or liquor fumans (Boyle), is the name applied to a preparation prepared by adding washed sulphur 1 part to concentrated ammonia 6 to 8 parts, and passing hydrogen sulphide through the mixture until the sulphur is dissolved.†

*Ichthyol* contains a large proportion of sulphur.

**Pharmacology.**—Sulphur is a non-metallic, solid element, found native in Sicily and Iceland in the neighborhood of extinct volcanoes; it is widely distributed in combination with metallic bases as sulphides, especially of iron, copper, lead, mercury, etc. It is of a lemon-yellow color, tasteless, odorless and brittle. At a temperature of 111.5° C., it melts into a brownish-yellow, transparent liquid, which crystallizes on cooling. It is dimorphous, having two distinct forms of crystals. Sulphur is insoluble in water, but very slightly soluble in alcohol, ether, and benzine; its best solvent is carbon disulphide. It is likewise soluble in the oil of turpentine and in alkaline fluids. It has powerful chemical affinities, and in combination with oxygen forms sulphurous and sulphuric acids, which, with bases, form sulphites and sulphates. Sulphur is an important constituent in certain native mineral springs, which furnish sulphuretted waters. In this place the action of sulphur need alone be considered. The sublimed sulphur contains a trace of free acid, which makes it slightly irritating, and, when taken into the intestines, it occasionally causes griping. Owing to its insolubility in water, sulphur, either washed or precipitated, has no effect upon the skin, although when kept in contact with it for some time it may be partially oxidized, forming sulphurous acid, which is an energetic disinfectant. In the alimentary canal, the pure sulphur acts as a laxative, partly as a result of chemical change (since hydrogen-sulphide gas is formed in considerable quantity, and sulphur compounds are found in the blood) and partly mechanically as a dry powder. By the interaction of hydrochloric and hyposulphurous acids Engel has lately succeeded in producing two new allotropic states of sulphur. One of these appears as orange-yellow crystals of the rhombohedral type which differ absolutely from any other form of sulphur hitherto known. The second occurs as yellow flakes entirely soluble in water. The solution decomposes rapidly, giving rise to the ordinary amorphous sulphur.

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* *Druggists' Circular*, January, 1891.

† *Druggists' Circular*, January, 1891.

**Physiological Action.**—The fact that sulphur enters the blood from the small intestine is shown by its chemical effects upon silver coins or jewelry worn by persons while taking it; secondly, by the physiological effects, its appearance in many secretions; and, thirdly, its therapeutic results as an alternative. The intestinal secretions are moderately increased by it, as well as the peristaltic movements, and the stools are rendered softer. It is believed to exert a stimulant effect upon the mucous membrane and skin, and strong applications in the form of an ointment bring out an eruption of an eczematous character. Erythema, papules or pustules, are also, in some cases, produced either by the external or internal use of this substance. Sulphur is excreted principally by the bowels, but also by the skin, the perspiratory and the milk-glands, and by the urine; in the latter it usually appears as a sulphate, in the others it is in the form of hydrogen sulphide. Sulphur plays an important part in the normal physiological processes of the body, being a constant constituent of albumin, and present in nearly all the solids and fluids of the body. From this fact and others, we are led to believe that sulphur is essential to the health of albuminous organs and tissues, and is an important element in nutrition. The antiseptic and germicidal effect of sulphur may exercise an important prophylactic influence in preventing, under ordinary circumstances, the invasion of the tissues by micro-organisms. Observations were published a short time ago by Prof. H. C. Wood as to the absorption of hydrogen-sulphide gas by the intestinal mucous membrane and its passage into the blood to be carried to the lungs, where it escapes from the bronchial mucous membrane and acts as a local disinfectant. This gives a hint of the unsuspected rôle, played by sulphur, of a pulmonary disinfectant and expectorant, in addition to the property, for which it is already valued, of an intestinal disinfectant. It probably, after absorption, favors the bile-producing function of the liver, since taurocholic acid normally contains a large proportion of sulphur. Upon the circulation no direct effect is noticed, but it is believed that it increases the heart's vigor, as it does that of muscular tissue in the arteries and in the various hollow viscera, as well as the voluntary muscles.*

**Therapy.**—Sulphur is used in a very large number of diseases externally, and ofted with marked curative action. In acute infectious disorders (diphtheria or scarlatina, for instance), the flowers of sulphur may be insufflated into the throat or nose with marked benefit, limiting the spread of the disease, destroying the micro-organisms, and preventing blood-poisoning. In scarlatina, erysipelas, measles, and small-pox, an ointment containing sulphur moderates the heat of the skin, allays congestion or inflammation, and disinfects the pustules of variola. Dr. Iscar advocates the use of sulphur internally in variola and gives to children 2 grains every hour in a mixture of glycerin, orange-water and syrup. The use of baths containing potassium sulphide, or a resort to a sulphur spring, are of great value in syphilis. In very many integumentary inflammations, especially chronic eczema and psoriasis, sulphur alone, or combined with other drugs, will lessen the congestion and overcome the infiltration of the parts. It is often employed with advantage in chronic acne and rosacea, but great care should be exercised in applying it upon the face, especially if the sebaceous glands are in patulous condition. If brought in contact with the skin under the latter circumstances, the glands often become filled with sulphur and occasion many black points (acne punctata) upon the skin. The following formulæ are useful in acne, especially of the face:—

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* See paper by author on "The Physiological and Therapeutical Action of Sulphur," Transactions of the Pennsylvania State Medical Society, 1890.

℞ Sulphur. sublimati, . . . . . . . . ʒj.
Glycerini, . . . . . . . . . . fʒij.
Aquæ rosæ, . . . . . . . . q. s. ad fʒvj.
M. Sig.: Apply with a soft sponge at night, after evacuation of pustules and the local use of hot water.

℞ Sulphuris sublimati,
Pulv. marantæ,
Saloli, . . . . . . . . . . . āā ʒj.
Ungt. zinci oxidi, . . . . . . . . . . ℥j.
M. Sig.: For acne; apply once or twice daily.

In alopecia, especially the circumscribed variety, sulphur aften acts well in assisting to restore the growth of the hair. In very many diseases of the skin, especially those of a parasitic nature, this agent can be used more effectively in the form of a sulphur-vapor bath. Sulphur is very largely employed as an external remedy in scabies, but it is also excellent for pediculosis, tinea capitis, barbæ and corporis, and tinea versicolor. As a germicide, its effects are most evident when combined with oxygen, as sulphurous-acid gas. In treating scabies, no permanent result should be expected, unless measures are taken to prevent re-infection by the parasite. The under-clothing must be destroyed, or, at least, exposed to an elevated temperature for several hours, and thoroughly washed with soap and boiling water. The patient should take a warm bath, rubbing the interdigital spaces and flexures of affected points thoroughly with potash or soft soap. After the bath the following ointment may be rather freely applied to the affected spots, or where itching is experienced, and allowed to remain until morning, when it may be wiped off:—

℞ Ol. cadini, . . . . . . . . . . fʒj.
Ungt. sulphuris, . . . . . . . . . ʒij.
Lanolini, . . . . . . . . . . . ʒv.
M. Sig.: Apply at night, as directed.

A repetition of this treatment, once or twice, may effectually relieve the patient of his parasites. When the sulphur ointment is used it sometimes causes an eczematous eruption, which may be avoided by diluting the preparation. In pediculosis of the body a similar treatment to the above is generally effective, providing the clothing be changed at the same time. In either of the preceding cases, the cure is not to be attributed to the direct parasiticide effect of sulphur, but is owing to the fact that it makes a dense and tenacious substance with lard, which suffocates the itch-insect. Indeed, the late Professor Leidy was of the opinion that the sulphur is unnecessary, as the oil would block up the air-pores of the acarus just as well without it.

Mr. W. Arbuthnot Lane writes that he employs sulphur with decided advantage as a surgical dressing in tuberculosis of joints and bones and also in other infectious processes. The action is rendered more uniform and less violent by mixing it with glycerin. This emulsion is allowed to remain in the cavity for twenty-four hours, after which the seat of disease is irrigated every day by a weak corrosive sublimate solution or the sterile normal saline solution. He has, moreover, found sulphur beneficial in the foul ulcerative stomatitis so common in the children of the poor. Finely powdered sulphur is dusted upon a piece of gauze which is applied to the ulcerated surface for an hour or two, after which the lesion begins to heal rapidly; in some cases several applications may be necessary. The same method is efficacious in the foul impetiginous ulcers of children.

In sciatica, H. G. de Mussy envelops the limb in a cloth containing a thick paste of the flowers of sulphur. One night is sufficient to relieve the patient. The urine acquires a very strong odor of hydrogen sulphide. L. Duchesne also reports success with this in a case of several years' standing.* Friction with sulphur affords relief in obstinate cases of chronic rheumatism.

Internally, sulphur is used as a simple laxative, especially combined with potassium bitartrate, in affections of the lower bowel, irritable piles, stricture, fissure or fistula. By relieving engorgement of the hæmorrhoidal vessels, sulphur proves useful in cases of bleeding from piles. After operations upon the pelvic organs it is the best laxative to administer. The dose ordinarily need not be more than 5 to 10 grains daily in order to insure a free evacuation of the bowels, and if it is continued for some time we obtain valuable systemic effects. In chronic sore throat, associated with, or springing from, indigestion, these small doses of sulphur, with some attention to hygiene, will effect a cure. In digestive difficulties due to disordered action of the liver, which ultimately lead to lithæmia and structural lesions, the habits of life must first be corrected, and the hepatic torpor will then be overcome by small doses of sulphur. Dr. Garrod has reported remarkable relief from obstinate hepatic colic by the daily use of a 5-grain sulphur lozenge, persisted in for months. In hepatic disorder attended by constipation, it may be well to administer a mercurial purge to initiate the treatment, before giving the tonic doses of sulphur. Dr. Schulz recommends the use of sulphur in certain cases of chlorosis. When iron is inefficient or cannot be tolerated the general condition is decidedly improved by sulphur and after this remedy has been used for some time the iron can be resumed with success. He regards it as of no avail when chlorosis is complicated with catarrhal and inflammatory conditions of the digestive tract. The remedy was given in small doses.

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* Annual of the Universal Medical Sciences, 1890, vol. v, page A-144.

Minute amounts of sulphur sometimes do good in diarrhœa, especially in cases of offensive watery stools of scrofulous children and in dysenteric diarrhœa. As sulphur stimulates mucous membranes, it is useful in chronic bronchitis, as Graves long ago pointed out in his clinical lectures. For this purpose sulphuretted mineral waters and the springs from which they flow are justly celebrated.

This remedy is especially suitable to the chronic bronchitis, accompanied with copious secretion, of aged and debilitated persons. In whooping-cough, small doses of sulphur lessen the paroxysms; and the following formula, as modified from Sée, may be administered:—

| | |
|---|---|
| ℞ Sulphuris præcip., | gr. l. |
| Extr. belladonnæ folior. alc., | gr. j. |
| Pulv. ipecacuanhæ et opii, | gr. v. |
| Sacchari albi, | gr. xx. |

M. et ft. capsulæ vel chartæ x.

Sig.: From two to ten capsules or powders a day, according to the age of patient and effect produced.

Garrod suggests that sulphur may be of service in cystitis, and, perhaps, in some disorders of the kidney. It might very properly be tried in tubercular or gouty pyelitis, and likewise in disordered menstruation, when largely or entirely functional in character. In muscular pains, attending lithæmia, gout, and rheumatism, Garrod employed small doses of sulphur in conjunction with iodine or arsenic, and he has seen great improvement from this treatment, even in rheumatoid arthritis. This remedy is also of avail in those cases of neuralgia dependent upon the rheumatic diathesis. Sulphur has not, hitherto, given very positive results in tuberculosis, but might be of great service in the incipient stages of pulmonary disease. The continued administration of fractional doses of sulphur is often beneficial in seborrhœa, sycosis, chronic eczema, psoriasis, and other cutaneous diseases, especially when the upper layer of the skin and the glands are involved. In alopecia, small doses of sulphur will often increase the activity of the hair-forming apparatus, and may also assist in restoring the hair to the parts. In diseases of the nails, especially when they become brittle, covered with ridges and white spots, the continued use of small doses of sulphur will frequently bring about a healthy and polished appearance of these useful appendages.

Calcium sulphide, in the treatment of acne, has already been referred to. Spirit of sulphur was formerly believed to be a panacea, or a remedy possessing the quintessence of healing qualities; it was given in syphilis, rheumatism, diabetes, consumption, in doses of 3 or 4 drops, well diluted. It is merely a solution of ammonium sulphide, and might be given in larger doses without doing either much harm or good to the patient.

Sulphur has been highly esteemed as a fumigating agent for rooms which have been occupied by patients suffering from contagious disorders. Doubts have been thrown upon its value as a disinfectant by the experiments of Koch and Sternberg. These, however, related to the power of the gas in disinfecting apartments and large masses of material, such as contaminated rags in bales. The gas was rapidly lost by diffusion and was found to have slight influence upon dry spores. The anthrax bacillus has been generally employed as the test organism. The investigations of Thoinot demonstrate that while the anthrax bacillus is resistant to the action of sulphur, the organisms of tuberculosis, glanders, typhoid fever, cholera and diphtheria are destroyed by the fumigations.

**Thiuret.**—This name is given to an oxidation product of phenyldithiobiuret and occurs as a crystalline, odorless powder, insoluble in water but freely soluble in alcohol and ether. When mixed with alkalies, sulphur is disengaged in the nascent state. On this account thiuret is possessed of energetic antiseptic properties.

## SUMBUL (U. S. P.).—Sumbul, Musk-Root.

**Dose**, gr. x–ʒj.

*Preparations.*

*Tinctura Sumbul* (U. S. P.).—Tincture of Sumbul (10 per cent.). *Dose*, fʒss–j.
*Extractum Sumbul.*—Extract of Sumbul. *Dose*, gr. ¼–j.

**Pharmacology**.—Sumbul is the root of Ferula sumbul (Umbelliferæ), growing in Asia. The drug consists of transverse sections of the root. Sumbul has a decided odor, resembling musk, and a somewhat bitter, balsamic taste. It contains two acids, **angelic** and **valerianic**, two balsamic resins, a volatile oil, bitter extractive, etc.

**Physiological Action.**—In its effect upon the nervous system, sumbul resembles valerian, and is an efficient nerve-tonic. In small doses it stimulates the appetite and facilitates digestion.

**Therapy.**—Sumbul is of value in hysteria and neurasthenia, in anæmic women. For such cases Goodell prescribes:—

| | |
|---|---|
| ℞ Extracti sumbul alc., | |
| Ferri sulphatis exsiccat., | āā gr. xx. |
| Asafœtidæ, | gr. x. |
| Acid. arsenosi, | gr. ss. |

M. et ft. pilulæ no. xx.
Sig.: Take one, thrice daily, after meals.

Sumbul is useful, moreover, in the treatment of neuralgia, functional irregularity of the heart, restlessness, the insomnia of chronic alcoholism, and nervous dyspepsia. As most of these disorders are associated with impaired nutrition and sluggish movement of the bowels the author has, in many instances, associated it with nervine and laxative remedies, as in the following combination:—

| | |
|---|---|
| ℞ Extr. sumbul., | gr. j. |
| Asafœtidæ, | gr. j. |
| Extr. rhamni pursh., | gr. ss. |
| Aloin., | gr. $\frac{1}{10}$. |
| Extr. nucis vom., | gr. ⅛. |
| Gingerin., | gr. ¼. |

M. ft. pil. no. j.
Sig.: One or two pills to be given at a dose.

This preparation promotes the action of the liver and bowels, improves nutrition, allays irregular nervous manifestations and is beneficial in depressed or excitable conditions of the nervous system.*

The tincture may be given in hysteria, chronic bronchitis with spasmodic cough, also in delerium tremens, as a substitute for musk. By Russian practitioners, sumbul is esteemed a valuable stimulant in typhoid fever, atonic dyspepsia, asthenic diarrhœa, and dysentery. Dr. Granville, who introduced this remedy into England, recommended it in epilepsy and dysmenorrhœa. Phillips testifies to its decided efficacy in facial, sciatic, or ovarian neuralgia occurring in women of a quick and lively nervous temperament. He has seen it useful, also, in certain stages of phthisis, in the restlessness of pregnancy, and the insomnia of chronic alcoholism. It is essential that a fresh specimen, in good condition, should be employed in making the tincture, in order to get any results.

**SYMPHYTUM.—Symphytum, Comfrey.**

**Pharmacology.**—The Symphytum officinale (Boraginaceæ), a small herb of Europe and the United States, has a root possessing some medical properties. It contains some **Asparagin**, a large amount of mucilage, and traces of tannin. It is used in decoction.

**Physiological Action.**—The asparagin has little, if any, physiological effects beyond slight diuretic action; but the mucilage makes it demulcent and slightly astringent. The pulp of the root has been utilized as a means of stiffening bandages applied to fractures.

**Therapy.**—The fresh root, bruised and cut, is applied to wounds, bruises, cracked nipples, etc. Internally the decoction is given in diarrhœa, dysentery, pulmonary affections, and other relaxed conditions of mucous membranes. It is utilized for the purposes to which marshmallow is ordinarily applied, in domestic cough mixtures, etc.

**SYZYGIUM JAMBOLANUM.** See Jambol.

**TABACUM** (U. S. P.).—**Tobacco.**

*Preparations.*

*Infusum Tabaci.*—Infusion of Tobacco (ʒj–Oj). *Dose*, as an enema, fʒii–℥ij.
*Vinum Tabaci.*—Wine of Tobacco (℥i–Oj). *Dose*, ♏v–xxx.
*Oleum Tabaci.*—Oil of Tobacco. A virulent poison.
*Nicotina.*—Nicotine. *Dose*, ♏$\frac{1}{30}$–$\frac{1}{10}$.
*Unguentum Tabaci.*—Tobacco Ointment (ʒj or more to ℥j).

**Pharmacology.**—The commercial dried leaves of Nicotiana tabacum (Solanaceæ), indigenous to the southern portions of this country and cultivated in different parts of the world, are known as tobacco. It was carried to Europe by the Spaniards, and from the court at Lisbon it was taken to France, in 1560, by the French ambassador, whose name, Nicot, is preserved in the generic title applied to the plant. Its active principle is a liquid alkaloid, **Nicotine.** The fumes, when burning, contain **pyridine**, hydrocarbons of the aromatic series, small amounts of creosote, hydrocyanic and acetic acids, sulphur and carbon compounds, and certain gases, but little, if any, nicotine, which is decomposed by heat (Zeise). The existence of **Nicotianin**, a camphoracous substance, has been affirmed by Hermbstädt, but is denied by Flückiger, who considers it a fatty acid contaminated with a little volatile oil. Slight differences in composition exist in specimens grown in different places, as it is well known that the variation in flavor and quality is very decided. The best tobacco is grown in Cuba and Virginia. The Turkish variety is almost free from nicotine, and is very mild. In the East, the tobacco is sometimes tinctured with opium, in order to increase the narcotic effect. There are no official preparations.

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* See *Medical Bulletin*, May, 1893, p. 172.

**Physiological Action.**—Tobacco is an acro-narcotic poison, acting energetically, in small doses, upon persons unaccustomed to its use. It is a nauseating emetic, its action being accompanied by great muscular relaxation; the respiration and circulation are depressed, the temperature lowered, and the surface becomes cold and moistened with perspiration. It is a stimulant to the salivary and intestinal secretions, increases the peristaltic movements of the bowel and the flow of urine and perspiration. From experiments upon seven healthy persons unaccustomed to smoking, Dr. J. Ydan-Pouchkine found that tobacco diminishes the quantity of free hydrochloric acid in the gastric juice as well as the digestive power of the fluid, retards the action of pepsin, increases the movements and absorbent power of the stomach. It is without influence upon the acidity of the urine. The muscles, which at first are relaxed, may be seized later by tremor or clonic spasms, or even tonic contractions, followed by paresis of a transitory character. The nervous system is early affected by the drug. The motor nerves are paralyzed progressively from the periphery to the central organs; there are no marked effects upon the sensory nerves. Tobacco increases the excitability of the heart by a direct action upon its intrinsic ganglia. The spinal and cerebral centres become affected, and inco-ordination, a staggering gait, and vertigo are prominent symptoms of the toxic action. Finally, collapse and death may occur from paralysis of the heart or of the respiration. Similar results also follow the inhalation of tobacco-smoke, though generally they appear in a much milder form than when the drug is swallowed. Poisoning has also followed the application of tobacco-leaves to a wound, in the case of a child twelve years of age. **Nicotine** is a most active poison, resembling hydrocyanic acid in the rapidity of its fatal effects. It is a powerful antiseptic. The use of tobacco in the form of snuff, or by chewing or smoking, is almost universal, and extends to uncivilized and civilized alike, and is especially prevalent among the robust and those who lead an active life. In fact, tobacco must perform some important part in physiological life, or in the struggle for existence, or it would not be so widely used by men who are distinguished by the soundness of their judgment and their success in solving the problems of social existence in every other detail. The slightly depressing effects of tobacco, the power of increasing the secretions along the alimentary canal, while favoring peristalsis and the function of the kidneys, are valid arguments for moderate indulgence in the post-prandial cigar; but there are also psychic effects which follow its use: it allays restlessness and muscular irritability, and creates a lassitude which is favorable to the pleasant flow of fancy, so happily illustrated in the "Reveries of a Bachelor" of Donald G. Mitchell. The fact that it is a sexual sedative may or may not contribute to its popularity among those who lead sedentary lives, and who find it helpful to them from experience of its effects, rather than from any judgment based upon an exhaustive knowledge of its physiological action. Occasionally, from smoking an unusually strong cigar, or too many of them, there is nausea and vertigo, even in practised smokers. In such cases, a stimulant, such as aromatic spirit of ammonia or compound spirit of ether, promptly alleviates the distress.

According to the records of the senior classes of Yale College for the last eight years, however, those who used no tobacco were 20 per cent. taller than the smokers, 25 per cent. heavier and had 66 per cent. more lung capacity.

**Poisoning and Antidotes.**—In cases of acute poisoning and collapse, strychnine, and ether, or other stimulant may be given hypodermically, and the patient kept quiet and warm. Mustard-leaves may be applied to the chest and other parts of the body, and artificial respiration practised, if needed. Stimulating enemata, containing alcohol or turpentine, may be useful; and, if there is much vomiting, brandy and ice may be given in small quantities. Tannic acid and iodides are chemically incompatible, and camphor is a physiological antidote. In what might be called chronic tobacco-poisoning, we have various inflammations of the mouth; epithelial cancer occasionally of the lip or tongue; follicular pharyngitis; bronchial catarrh; rapid, weak, and irregular action of the heart, which may become hypertrophied; dyspepsia, and weakness of sight, due to restriction of the field of vision (scotoma), which may progress to total blindness. Color-blindness has been attributed to the excessive use of strong tobacco. Muscular weakness and tremors and reduced capacity for physical and mental exercise are common symptoms of an abuse of tobacco. Probably, the need of something to restore the nervous system after using tobacco is one explanation of the frequent resort to alcoholic stimulants by users of the weed. The habit of excessive indulgence is especially injurious when the fumes are inhaled, as in cigarette-smoking, as by this means the poisonous products are brought directly into the air-cells, and are absorbed by the blood. In all such cases the treatment must begin by reduction, or complete cessation, of the habit of smoking, and the administration of strychnine sulphate in small doses, with open-air exercise. If there is much overaction of the heart, it can be steadied by small doses of opium, with digitalis or strophanthus.

**Therapy.**—Tobacco is not used medicinally, its good effects as a cathartic not being of sufficient value to counteract its depressing action upon the heart and respiration, to which some persons are especially liable to suffer. The only practical application is to afford an excuse for the prescription of an Havana after a good dinner, as an aid to digestion. Tobacco may be mixed with stramonium or belladonna, and the smoke inhaled, with relief in asthma. The use of tobacco-snuff is said to be efficacious in breaking up stubborn paroxysms of hiccough. It should not be administered internally for strychnine poisoning, nor in tetanus, nor used per enema.

Previous to the introduction of chloroform and ether, tobacco was much employed in order to produce muscular relaxation in strangulated hernia, after fracture of the femur, etc. Every purpose for which tobacco was formerly used is now accomplished more efficiently and safely by the anæsthetics.

**TAMARINDUS** (U. S. P.).—**Tamarind.**

**Pharmacology and Therapy.**—The preserved pulp of the fruit of Tamarindus Indica (Leguminosæ) is only used in medicine for the purpose of making a refrigerant and somewhat laxative infusion, and also as an ingredient in the confection of senna. A tamarind whey, which may be used as a refrigerant in fevers, is made by infusing an ounce of the pulp in a little boiling water, and adding this to a quart of milk.

**TANACETUM** (U. S. P.).—**Tansy.**

**Pharmacology.**—The leaves and tops of Tanacetum vulgare (Compositæ), or common tansy, contain a bitter principle, **Tanacetin,** a volatile oil, tannic acid, etc. The dose of the volatile oil is ♏i–iij ; a fluid extract and an infusion (ʒj–Oj) are also used.

**Physiological Action.**—Tansy is an aromatic, bitter tonic, and, by virtue of its volatile oil, it is diuretic and emmenagogue. Large doses, half an ounce or more of the oil, taken to procure abortion, cause disturbance of the respiration, depression of heart's action, clonic spasms, stupor, and death ; sometimes it causes abortion, but only because of its violent irritant action upon the gastro-intestinal tract, which may lead to inflammation.

**Poisoning.**—The treatment of an overdose is the free use of demulcents and purgatives to clean out the stomach and bowels, followed by opium and bismuth and diffusible stimulants.

**Therapy.**—Tansy is a useful ingredient in functional dysmenorrhœa, amenorrhœa, and ovaralgia, in doses of ♏ss–j, in pill, or dropped on sugar. In suppressed menstruation from cold, it may be given in conjunction with hot drinks and hot applications. It has some anthelmintic effects, but should not be used for this purpose.

**TARAXACUM** (U. S. P.).—**Dandelion.**

*Preparations.*

*Extractum Taraxaci* (U. S. P.).—Extract of Taraxacum. *Dose*, gr. x–xl.
*Ext. Taraxaci Fluidum* (U. S. P.).—Fluid Extract of Taraxacum. *Dose*, fʒi–ij.
*Infusum Taraxaci.*—Infusion of Taraxacum (℥ii–Oj). *Dose*, f℥i–ij.

**Pharmacology.**—The root of Taraxacum officinale (Compositæ), or dandelion, should be gathered in the autumn. It is a well-known common perennial of America and Europe, bearing a yellow head of flowers on a slender peduncle, from a cluster of radial leaves. All parts of the plant contain a milky, acrid juice, which exudes when the plant is cut or bruised. It contains **asparagin** (found also in asparagus, marshmallow, liquorice-root, wahoo or euonymus, the potato-plant, and the root of the locust-tree—Robinia pseudacacia), which has little, if any, therapeutical value. The active principles are **Taraxacin** and

**Taraxacerin**; the former is dissolved out by hot water, the latter by alcohol, from the insoluble residue. The root also contains inulin, mannite and resin.

**Physiological Action.**—Dandelion preparations are bitter, and probably stimulate the digestive secretions and act as a tonic. It is a feeble, hepatic stimulant, according to Rutherford. It is somewhat laxative, and also diuretic.

**Therapy.**—In deficient secretion of gastric juice or of the bile in atonic dyspepsia and torpid liver, taraxacum acts as a mild stomachic and is of service in duodenal dyspepsia. Dandelion is also prescribed in catarrhal jaundice. It has no specific action in liver disorders, but is often combined with other remedies which have such effect:—

℞ Potassii iodidi, . . . . . . . . . . ʒj.
Ext. taraxaci fl.,
Syr. glycyrrhizæ, . . . . . . . . . āā f℥ij.

M. Sig.: A tablespoonful four times daily, for incipient cirrhosis of the liver.

The fluid extract of taraxacum is an acceptable vehicle for nitrohydrochloric acid or ammonium chloride.

### TEREBINTHINA (U. S. P.).—Turpentine.

*Preparations.*

*Oleum Terebinthinæ* (U. S. P.).—Oil of turpentine. *Dose*, ♏v–xv, or as an anthelmintic, f℥ss.

*Linimentum Terebinthinæ* (U. S. P.).—Turpentine Liniment (resin cerate, 65 parts; oil of turpentine, 35 parts).

*Linimentum Cantharidis.*—Cantharides Liniment (cantharides, 15 parts; oil of turpentine, 85 parts). A strong counter-irritant.

*Terebenum* (U. S. P.).—Terebene. *Dose*, ♏v–xx.

*Terpini Hydras* (U. S. P.).—Terpin Hydrate. *Dose*, gr. x–xx.

**Pharmacology.**—Turpentine is a concrete oleoresin, obtained from Pinus palustris, and from other species of Pinus (Coniferæ). It consists of a votatile oil, which is known as oil of turpentine, or, incorrectly, spirit of turpentine, and resin. The oil is distilled from any variety of Pinus capable of furnishing it, and, at first, is a thin, limpid liquid, but afterward gradually absorbs oxygen from the air and forms resin, which makes it thicker. Old oil of turpentine is an ozonizing agent, and is recommended in cases of phosphorous poisoning. Chian turpentine (Pistacia terebinthus), coming from Chio and Cyprus, does not materially differ from the ordinary form, except that it has a more agreeable odor, resembling that of lemon or fennel; and as it does not come from any species of Pinus, but is produced by a larch-tree (belonging to the Anacardiaceæ), it is not an official variety. It is given in doses of gr. iii–v, in an emulsion. White turpentine (Thus Americanum, Ph. B.) is identical with the whitish, granular, under layer, or solid matter, deposited by turpentine upon standing; it is the spontaneous exudation upon the tree, which is scraped off and sent to market in yellowish-white masses, known under this name. The various forms of turpentine are soluble in alcohol, forming what is commonly called varnish. Turpentine is very inflammable, and burns with a heavy cloud of black smoke of unconsumed carbon. The oil is inflammable and explosive. The oil of turpentine possesses a peculiar, characteristic odor and taste, has a specific gravity of 0.86, is soluble in alcohol, ether, chloroform, glacial acetic acid, benzol, and insoluble in water. It is a solvent for wax, iodine, sulphur, phosphorus, and fixed oils. Rectified oil of turpentine is oil which has been re-distilled; it is the only form suitable for internal administration.

**Canada Turpentine**, or balsam of fir, is official (see Terebinthina Canadensis). It is a liquid oleoresin, obtained from Abies balsamea, used principally in the arts and in mounting microscopic objects. Catramine, an essential oil, closely related to turpentine, contains a larger proportion of resin than the latter. Its physiological action resembles that of the oil of turpentine. It is eliminated in the urine in the form of a resin, and is recommended by Vincenzo Gauthier in chronic bronchial affections with profuse secretion.

**Physiological Action.**—The oil of turpentine has valuable antiseptic qualities. When applied to the skin it produces redness, tingling, and irritation, and may cause inflammation and blistering. In some cases it even gives rise to ulceration. Some persons are very susceptible to its effects, and the local application will cause marked systemic disorder, with an erythematous rash. Desquamation may follow. Taken by the mouth, turpentine will likewise occasionally give rise to an erythematous, vesicular or papular eruption. In small doses (♏x-xx), oil of turpentine is a stimulant; in large amounts, an irritant. Doses of fʒi-ij cause burning in the mouth and stomach, with thirst; larger quantities give rise to vomiting and purging, with tenesmus; these effects, however, may be avoided by combination with other agents, and especially demulcents. Koutonzoff declares, as a result of experiments upon six healthy men, that turpentine dissolves the albuminoids of the food in the stomach when hydrochloric acid is still absent; that it first diminishes and subsequently increases the secretion of the gastric juice; that it moderately excites the motility of the stomach and the absorbent power of the mucous membrane. Upon the circulation, the effects are those of a cardiac stimulant, the pulse is increased in force and in frequency, but toxic doses occasion collapse, with feeble pulse. According to Kobert, medicinal doses increase the blood-pressure by "powerfully stimulating the inhibitory reflex centre, and also the vaso-motor centre," but very large doses paralyze both centres, the blood becoming dark and the heart paralyzed. Injection of oil of turpentine into the vessels causes lowering of blood-pressure, with increase of pulse-rate. In small doses it produces vascular contraction. From the very diffusible nature of this substance, it readily finds its way into the circulation, and is carried to the nerve-centres. After poisoning by it, the brain has the characteristic odor of turpentine; it has, therefore, been inferred by Bartholow that it exerts a direct influence upon the nerve-cells. It is through the nervous system that its effects are mainly manifested. After moderate or continued doses, slight exhilaration, like that following alcohol, is observed, followed by an hypnotic effect; toxic amounts cause delirium, with depressed intellection or stupor, impaired physical power, defective co-ordination (followed by paralysis), coma, with dilated pupils, and death. Such amounts have caused complete muscular relaxation, profound insensibility, and abolition of all reflex movements. Six ounces have occasioned death in an adult, preceded by opisthotonos; "the brain, heart, lung, and viscera were found gorged with blood."

Turpentine is eliminated by the skin and bowels, but principally by the bronchial mucous membrane and kidneys. Its odor is perceptible in the breath. It communicates to the urine a smell similar to that of violets, though, when the dose has been large, the urine possesses a terebinthinate odor. Heat and dryness of the skin and pruritus, sometimes result from the internal use of turpentine.

**Treatment of Poisoning.**—Where persons have been made sick by the vapor of turpentine, as by sleeping in a newly-painted room, it is necessary to give them a supply of pure, fresh air, with cardiac stimulants and diuretics, encouraging the action of the kidneys and skin by hot drinks and pilocarpine. If large amounts have been swallowed, demulcents with opiates are required.

**Therapy.**—Oil of turpentine is a valuable counter-irritant in peritonitis, pneumonia, bronchitis, asthma, and painful disorders, such as lumbago, pleurodynia, myalgia, etc. A turpentine stupe consists of a piece of flannel heated by steam or by being wrung out of hot water, with a few drops of turpentine sprinkled upon its surface just before application. Spongiopiline may be similarly used. A mixture of equal parts of turpentine and yelk of egg is also serviceably applied to the skin for the same purpose. A turpentine stupe should be removed as soon as it causes pain. In rheumatic joints, a liniment containing turpentine is useful, but the official liniment requires dilution:—

℞ Liniment. terebinthinæ,
Tr. opii, . . . . . . . . . . āā f℥j.
Lin. saponis, . . . . . . . . . . f℥iij.
M. Sig.: For external use in rheumatism, to be used with friction.

In peritonitis turpentine can be applied over the abdomen, either alone or combined thus, with much benefit:—

℞ Olei terebinthinæ,
Olei olivæ, . . . . . . . . . āā f℥ij.
Mass. hydrargyri, . . . . . . . . . ℥ij.
M. Sig.: Apply warm with flannel over the abdomen, in peritonitis.

Preparations containing turpentine are advantageous external applications in inflammatory affections of the larynx, pharynx, and tonsils. In diphtheria it has been beneficially employed as a topical remedy, being applied by means of a brush, or administered in the form of a spray or by inhalation of the vapor. Dr. Charles Smith has derived advantage in diphtheria from the continuous inhalation of a mixture composed of 1 part each of carbolic acid and eucalyptus oil and 8 parts of turpentine. Cloths saturated in the fluid are hung or laid near the face of the patient, care being taken that they do not come in contact with the skin.

In order to render the air-passages aseptic, Delthil recommends inhalation of the following mixture:—

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|---|---|
| ℞ Ess. terebinth., | f℥xj. |
| Ess. lavandul., | f℥ij. |
| Iodoform., | ʒiiss. |
| Æther. sulph., | fʒv. |
| M. | |

Turpentine has been used with success in the treatment of severe burns, accompanied by constitutional depression. The injured area is first washed with turpentine, after which a mixture of resin ointment and turpentine is applied. A tablespoonful of turpentine is a useful addition to an enema, especially when given for flatulent colic. Turpentine enemata also assist in combating the stupor of narcotic poisoning and are useful derivatives in sunstroke and cerebro-spinal meningitis. Turpentine is efficacious in the treatment of chilblains. An ointment of turpentine is official in the British Pharmacopœia, and is used with advantage in chronic eczema, psoriasis, and alopecia circumscripta. It may also be applied with good effect to unhealthy or indolent ulcers.

Internally, the oil of turpentine is antiseptic and astringent in some forms of diarrhœa, especially of a catarrhal character.

It is valuable in acute dysentery after the violence of the attack has somewhat subsided. Turpentine is likewise useful in epidemic dysentery. A few drops of this oil form an excellent remedy in flatulence and may be of benefit in ulcer of the stomach or bowels. In typhoid fever, small doses, given in conjunction with the mineral-acid treatment, are a valuable adjunct, especially when the tongue is red, dry, and clean, and there is abdominal distention. It is best given in emulsion:—

| | |
|---|---|
| ℞ Ol. terebinthinæ, | f℥ss. |
| Pulv. acaciæ, | ʒiv. |
| Aquæ cinnamomi, | f℥viij. |
| M. secundem artem. | |

Sig.: One tablespoonful every two or three hours in typhoid fever, or the whole amount may be taken at once to remove a tape-worm.

The unpleasant taste of turpentine may be disguised by the addition of glycerin in the proportion of about a drachm to the ounce of mixture.

This remedy is, furthermore, valuable in typhoid fever by relieving tympanites and restraining hæmorrhage. If diarrhœa persist or recur during convalescence from this disease, recourse should be had to turpentine. In various forms of hæmorrhage, turpentine is valuable, as in hæmaturia, purpura hæmorrhagica, and in gastric ulcer. It has been found efficient in post-partum hæmorrhage, and is peculiarly valuable in this condition on account of the rapidity of its action. Turpentine also checks the bleeding of scurvy. It is especially in passive hæmorrhage that this remedy is of service. In hæmaturia it has likewise been given with success, but it must be employed only in small doses, and its effects very carefully watched. The unpalatable taste of this liquid is not infrequently a bar to its administration. When the dose consists of but a few drops they may conveniently be given in capsules. Glycerin, with the addition of a drop or two of oil of gaultheria, is said to disguise the taste of turpentine. The following has been recommended as a mixture of not unpleasant taste:—

℞ Ol. terebinthinæ, . . . . . . . . . . f ʒ ij.
Ætheris, . . . . . . . . . . . . f ʒ iss.
Syrup. aurantii, . . . . . . . . . . f ℥ iss.
Aquæ, . . . . . . . . . . . q. s. ad f ℥ vj.
M. Sig.: Dose, a teaspoonful.

In chronic cystitis, pyelitis, and gleet, and in bronchorrhœa, small doses of oil of turpentine check the discharge and act as an antiseptic. Incontinence of urine, spermatorrhœa, and prostatorrhœa dependent upon relaxation are not infrequently relieved by turpentine. In addition to its strictly therapeutical effects turpentine is serviceable in incontinence of urine by overcoming the odor due to the dribbling of the fluid and converting it into a scent resembling that of violets. In low fevers the addition of a drachm of this oil to a hot punch often rouses the patient from a condition of stupor, and acts as a stimulant to the circulation. As a cardiac stimulant, turpentine is of service in puerperal fever, phlegmonous erysipelas, and yellow fever, in capillary bronchitis, pneumonia, and emphysema. In gangrene of the lung it diminishes fœtor.

A mixture of turpentine and ether (equal parts) is supposed to have some influence in removing gall-stones, but it is not probable that it has the effect of dissolving them, as was claimed by Durande; the effects are those of a carminative and antipasmodic. It is useful in this combination (1 part to 3 of ether) in colic as an anodyne. Dr. Hughlings Jackson used oil of turpentine in chorea. The vapor of steam, impregnated with turpentine, is employed for inhalation in laryngeal and bronchial disorders. In erysipelas it may be painted on the surface and taken internally. It is a good local application in ringworm, and has been also employed successfully in some cases of psoriasis by Dr. Crocker in the form of an embrocation with olive-oil (1 to 4), gradually increasing the strength until the pure turpentine-oil is used. The same writer has derived good results in psoriasis and chronic eczema from the internal administration of oil of turpentine in doses of 10 to 40 minims in emulsion after each meal. King Chambers has found that an enema containing half an ounce of the oil, or more, is of great value in sciatica; in which affection this remedy is sometimes beneficially given internally in ½-ounce doses, repeated for several successive nights. In other forms of neuralgia it has proved of service. It seems to be of particular value in debilitated or aged subjects, in whom degeneration of nerve-tissue has occurred. In such cases 2-drachm doses have been found more efficient than smaller quantities. Phillips thinks turpentine particularly indicated when neuralgia is of rheumatic origin. This oil is of undoubted efficacy in chronic rheumatism, relieving the pain and checking the progress of the disease. Amendment takes place under the influence of turpentine in rheumatic sclerotitis, iritis, and choroiditis. Nervous headache is sometimes relieved by this agent; 20 drops of turpentine thrice daily is strongly recommended in lumbago by Dr. George Bird. According to Begbie, turpentine is of service in hydatid cysts, especially of the lung. Phillips has found this remedy, in doses of 1 or 2 minims, night and morning (not fasting), to be of service in certain chronic cases of albuminuria unattended by pronounced symptoms of Bright's disease, reducing the amount of albumin and improving the general condition.

As a general rule, the addition of a drachm or two of oil of turpentine to an enema makes it more stimulating, and therefore this treatment can be adopted in narcotic poisoning. An enema containing turpentine relieves flatulence and constipation, and, as a derivative, is of value in sun-stroke and cerebro-spinal meningitis. As an anthelmintic, it may be combined with castor-oil and is very effective against round worms as well as tænia.

**Caution.**—Being a stimulating diuretic, the oil of turpentine should be used with caution, as it is apt to produce frequent and painful micturition, with bloody urine, strangury, and inflammation of the kidneys. These symptoms may result from constant inhalation of its vapor. Hæmaturia is not uncommon among sailors engaged on vessels carrying turpentine. Priapism, menorrhagia, and dysmenorrhœa are sometimes occasioned by turpentine. The free use of barley-water and other demulcents, the hot bath, and free purgation will generally quickly relieve the symptoms unless nephritis should occur. Turpentine should not be employed when cardiac hypertrophy or atheroma of vessels exists.

**Chian turpentine** has been recommended for the cure of scirrhus and other malignant disease of the uterus by Mr. Clay, of Manchester. This writer insists that the drug should be pure, that its use should be begun at an early stage of the disease and continued for a year after the manifestations have disappeared or the tumor has been removed by operation. In spite of his favorable experience, similar good results have not followed its administration in the hands of other observers. The pain of cancer is, however, not infrequently assuaged by Chian turpentine. Its administration in doses of 5 to 15 grains has likewise been followed by improvement in pityriasis rubra.

**Cerebene** is obtained by subjecting oil of turpentine to the action of sulphuric acid and distilling at a temperature of 160° F. It is a clear, mobile liquid, having a peculiar, fresh-pine odor and pungent taste; freely soluble in alcohol, chloroform, and ether, but sparingly soluble in water. In doses of ♏v–xx, it is given with benefit in winter cough, with muco-purulent expectoration, by Dr. Murrell. He finds it useful as an antiseptic in flatulent dyspepsia; also in cystitis and gleet. In diseases of the genito-urinary tract, it can be prescribed as follows:—

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|---|---|
| ℞ Terebeni, | ♏c. |
| Tinct. belladonnæ folior., | ♏lx. |
| Salolis, | gr. c. |

M. et ft. capsulæ no. xx.

Sig.: From four to six capsules a day, in gleet, stricture, and irritation of the bladder.

In bronchitis and bronchorrhœa, in emphysema, in catarrhal affections of the upper air-passages, even in phthisis, it has been found highly valuable for inhalation. It has no specific action when administered in phthisis, but probably exerts some local astringent and antiseptic effect upon the bronchial mucous membrane, by which it is chiefly excreted. Terebene has been used with benefit in puerperal fever. In genito-urinary disease it has been given as a substitute for oil of sandalwood. It should be administered in capsules in the dose of 5 or 10 minims, repeated every three hours. In some cases it irritates the stomach, and might then be made into an emulsion. In other instances terebene has had a similar effect upon the bowels or kidneys. A 5-per-cent. aqueous solution of terebene has been locally used as a disinfectant wash in surgical cases.

**Terebinthine**, a hydrocarbon of similar composition, is obtained by distilling oil of turpentine with an alkali. By hydration, it is converted into terebinthine hydrate, commonly called **terpin hydrate**, a crystalline, solid body, soluble in glycerin, water and alcohol. It dissolves sparingly in ether and chloroform. Terpin hydrate occurs in the form of large, colorless rhombic crystals, destitute of odor and having a faint aromatic taste.

Acids convert it into terpinol, another liquid body similar to terebene, but given in smaller doses (♏ii–v). It is used to fulfill very much the same indications as the preceding. Terpinol has an odor which resembles that of hyacinths, is almost insoluble in water, but dissolves readily in ether and alcohol.

Terpin hydrate was used by Manasse in forty-one cases of whooping-cough. No ill effects upon kidneys or bowels were observed in children from doses of 20 grains. In doses of 15 to 45 grains, according to age, the severity of the convulsive attacks was notably moderated.

Dr. Talamon makes use of the following combination :—

| | |
|---|---|
| ℞ Terpin. hydrat., | gr. xv. |
| Antipyrin., | gr. xv. |
| Syr. aurant. cort., | f℥ij. |
| Mucilag. acaciæ, | f℥ij. |

M. Sig.: One or two ounces several times a day for a child under four years of age.

As a local application for diphtheria, Dr. Hutinel uses, in the Hôpital des Enfants :—

| | |
|---|---|
| ℞ Terpin. hydrat., | ʒij. |
| Hydrarg. chlorid. corros., | gr. ivss. |
| Essent. menthæ pip., | f℥iij. |
| Sp. vini rectificat., | f℥iij. |
| Essent. thymi, | ♏vj.—M. |

Dr. Hugo J. Loebinger, of New York, uses terpin hydrate with advantage in hay asthma, giving it in 15- to 20-grain doses. Terpin hydrate, being a solid, is given in capsules, in bronchial affections, coughs, catarrhs, colds, etc., in doses of gr. ii–x.

Dr. William Murrell, of London, prescribes terpin hydrate in a solution containing 5 grains to the half ounce, made up with simple elixir and flavored either with syrup of wild cherry, syrup of tar, or cherry-laurel water. For patients who cannot take sugar the elixir may be made with saccharin. According to Dr. Murrell, terpin hydrate also possesses diuretic properties and has been used with advantage in neuralgia. It should not be confounded with a body of similar name, terpene, found in eucalyptus.

**TETRONAL.—Trional.**

**Dose,** gr. v–ʒj.

**Pharmacology and Physiological Action.**—Tetronal and trional are allied to sulphonal, having the same general formula, except that whereas sulphonal contains only two ethyl groups, trional and tetronal contain three and four, respectively.

Trional occurs as brilliant tablets, tetronal as brilliant tablets and scales. Both substances have a bitter taste, that of tetronal being at the same time camphoraceous. Trional is devoid of odor, is readily soluble in alcohol and ether, sparingly soluble in cold water and is best administered in warm water, milk, soup or tea. Trional melts at 76° C. (168.8° F.). Tetronal dissolves in alcohol and ether, but is less soluble in water than trional.

Baumann and Kast have published the results of a number of physiological experiments with compounds allied to sulphonal, from which they drew the conclusion that the hypnotic action of this class is a function of the ethyl groups in the compound, and proportionate in intensity to their number, and that the $SO_2$ group exercises no influence in this direction. These results were so suggestive that Barth and Rumpel repeated the experiments clinically and on the human subject. The results obtained corresponded to the observations made upon dogs only so far as to demonstrate that tetronal and trional actually possessed hypnotic properties, but they did not confirm the theory, since practically the same doses were required in order to produce the same effects as those of sulphonal, instead of one-half to two-thirds, as might have been expected. These agents might be useful in cases where sulphonal cannot be taken. No injurious effects were observed in any of the 220 cases in which trional and tetronal were administered.*

The use of trional, even when continued for a considerable period, has seldom been productive of evil consequences, or established a habit. Its disuse, moreover, has not been followed by any manifestations except, possibly, the return of the insomnia for which it was originally given. It has little or no influence upon the action of the heart. Schultze has, however, reported† a case in which trional had been given every night for four or five weeks. The patient was a woman afflicted with melancholia and sleeplessness. Toward the end of the period named her condition, without apparent cause, became aggravated, the urine assumed a dark red, almost black, color, which was demonstrated to be due to the presence of hæmatoporphyrin. It is, therefore, advisable that in every case where trional is continuously given, the urine should be carefully watched. From experiments upon animals, Dr. Otto Bakofen determined that trional is toxic only in massive doses given continuously, or with short interruptions. In his investigations he never found any changes in the kidneys or observed hæmatoporphyrinuria. Both tetronal and trional have a slight cumulative action. When excessive doses have been taken as a result of accident or from suicidal intent, the stomach should be emptied or, if free absorption has taken place, elimination should be hastened by the use of diuretics, and stimulants should be administered.

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* *Pharmaceutical Journal and Transactions*, August 30, 1890, and *Therapeutic Gazette*, October 15, 1890, p. 700.

† *Deutsche Medicinische Wochenschrift*, February 15, 1894.

**Therapy.**—In delirium tremens, tetronal is less efficient than sulphonal; but as a hypnotic tetronal was found, in 14 cases out of 30, superior to the latter drug, in 6 cases equal, and in only 4 inferior. Trional in 17 cases was superior, in 6 cases equal, and in 7 inferior. Barth and Rumpel conclude that the indications for the use of these compounds correspond with those of sulphonal, and in certain nervous conditions which are refractory to this drug the others may prove more effective, or, at least, are useful substitutes. Dr. J. B. Mattison, of Brooklyn, has found trional of advantage in the treatment of the opium, chloral or cocaine habit, and regards it as the most powerful hypnotic at present at our command. In accord with other observers, he has failed to find it useful as an anodyne, but states that in painful conditions a combination with codeine or phenacetin will often produce an excellent result.

Dr. Ernest Schulze, of the Insane Asylum at Bonn, has detailed* the results of his experience with these bodies. He found that trional succeeded in some cases where sulphonal had failed; that both trional and tetronal could be given without any by-effects, in some cases in which sulphonal had given rise to headache, œdema of the eyelids, or hallucinations; and that trional and tetronal were more rapid in their action than sulphonal.

Tetronal sometimes gave rise to loss of appetite and vomiting, but no injurious consequences to heart, lungs, or kidneys had been seen to follow the use of trional or tetronal. Trional in most cases seemed to be preferable to tetronal.

Dr. William Mabon, of the State Hospital at Utica, N. Y., concludes that both tetronal and trional possess decided hypnotic and sedative power. Trional appeared to be of superior value as an hypnotic for the insane but, tetronal seemed to give the best results as a sedative. The efficacy of trional is principally displayed in simple insomnia occurring in functional or organic nervous diseases. Trional caused sleep in most cases of alienation accompanied by moderate or severe excitement, but was without effect upon the mental condition. In some insane epileptics, though trional was without effect upon the frequency or severity of the paroxysms, it shortened the post-epileptic delirium. According to some writers, trional is contra-indicated in melancholia, hypochondria or whenever mental depression is present. Trional given by the rectum in a somewhat increased dose has likewise proved efficient. Koppers states that a dose of 4 to 8 grains of trional is of value in restraining night-sweats. In one case of heart disease the use of trional was followed by a decrease of blood-pressure. Dr. A. Claus, of Ghent, has found trional valuable in the "night terrors" so common in nervous children and also where sleeplessness is, in children, associated with chorea or convulsions. Spitzer, from a wide experience, concludes that trional is valuable in sleeplessness of pulmonary and cardiac affections as well as in insomnia due to intercostal neuralgia, sciatica, the lightning pains of tabes and even the pain of cancer. The effects approached those of morphine more nearly than of any other hypnotic.†

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* *Therapeutische Monatshefte*, October, 1891.

† *British Medical Journal*, July 27, 1895.

**TEUCRIUM.—Water-Germander, Woodsage.**

**Dose**, gr. xx–xxx.

**Pharmacology.**—The leaves and flowering tops of Teucrium scordeum (Labiatæ), growing abundantly in Central Europe and naturalized in some of the States along our Atlantic coast, possess medicinal properties. The taste is better and decidedly astringent. The virtues of the plant depend upon an oleoresin. Teucrium also contains an essential oil, which is warm and somewhat pungent to the taste. It may be given in the form of an infusion, the dose of which is 1 or 2 fluidounces, or of a fluid extract. The dose of the latter preparation is 1 or 2 fluidrachms.

**Physiological Action and Therapy.**—Teucrium possesses astringent and stimulant properties. Dr. John W. Eckfeldt reports that it is a useful antispasmodic in certain nervous disorders, as whooping-cough and hysteria of uterine origin. A syrup of teucrium is a good expectorant, restraining excessive secretion, and of especial service in the treatment of nervous coughs. The same observer has found this remedy of service in amenorrhœa and subacute rheumatism. He states that it has been used as an alterative in scrofulosis.

For the last five years Professor Mosetig, of Vienna, has made use of an extract of teucrium in the treatment of local tuberculous lesions. The extract, which he terms teucrin, is made by infusing the dried and not too old plant in hot water, concentrating the expressed juice to the consistence of honey, washing repeatedly in alcohol and evaporating to the specific gravity of 1.15. Teucrin is a dark brown fluid, having a cabbage-like smell and pungent taste, acid in reaction and contains a large amount of sulphur salts, especially calcium sulphide. Teucrin is miscible in all proportions with water. When injected beneath the skin in doses of 45 minims it gives rise to systemic and local manifestations. A fever of about twelve hours' duration and active hyperæmia at the site of puncture occur. As a result of the injection the temperature rises and sometimes a chill follows. It occasionally causes a cutaneous eruption. When tuberculosis of the lungs coexists the injections produce a milky appearance of the sputum. One or more injections are signally successful in converting chronic into acute abscesses, which may be evacuated and permanently healed. Good results were also obtained by this method in cases of degenerated and inflamed lymphatic glands. In lupus and actinomycosis improvement followed the injection of teucrin. This preparation may likewise be administered by the mouth and is said by Mosetig to be an excellent stomachic. Teucrin, made into an ointment, has been used as a local application to hæmorrhoids with asserted advantage.

Teucrium is particularly valuable in enlargement of the prostate and in hæmorrhoids. In the latter affection it may be used with good effect in the form of a suppository, and alleviates the itching which so often accompanies the condition.

**THALLIN.—Parachinanisols.**

**Dose**, gr. i–viij.

**Pharmacology.**—Thallin, a product prepared by synthesis, exhibits the form of colorless, rhombic crystals, soluble in water, alcohol, and ether. It forms salts with tartaric, tannic, hydrochloric, and sulphuric acids. The sulphate, which has been most generally employed, is a whitish, crystalline powder, of an aromatic smell and taste. Thallin sulphate is readily soluble in water, but sparingly so in alcohol.

**Physiological Action.**—Thallin possesses powerful antiseptic virtues, and a 4- to 5-per-cent. solution is capable of destroying micro-organisms. Large doses depress cardiac energy and reduce blood-pressure. It rapidly lowers febrile temperature by increasing the dissipation of heat, and the effect may continue for several hours,—though, as a rule, it is of rather brief duration. The reduction is often accompanied by profuse sweating, and extreme prostration. Vomiting and diarrhœa, chills, cutaneous rashes, cyanosis, or albuminuria may follow its administration. Thallin is speedily eliminated by the kidneys. Solutions of thallin sulphate assume a brownish color when exposed to air and light. In its elimination this substance communicates a dark discoloration to the urine.

**Therapy.**—Thallin has been used with advantage as an injection in gonorrhœa, the strength of the solution being from 2 to 2½ per cent. In gleet a weaker solution has given a favorable result. When administered for the purpose of reducing fever, it has been employed in hourly doses of ½ to 1 grain. In tuberculosis it reduces temperature very rapidly, but, even in small amounts, is apt to occasion alarming prostration. Some have praised its action in typhoid fever, but it has no influence over the duration of the disease; its effects upon the temperature is transient, and it is, upon the whole, less effective and less safe than other remedies of the same class. Professor Demme recommends thallin in the treatment of typhoid fever of children. Other observers have spoken favorably of the influence of thallin in the febrile affections of children. Dr. J. P. Crozer Griffith has derived good results from its use in measles, scarlet fever and other diseases characterized by high fever and severe nervous manifestations.

### THEINA.—Theine.

An alkaloid obtained from Camellia thea, probably identical with caffeine. (See Caffeine and Camellia.)

### THEOBROMA.—Cacao, Chocolate.

*Preparation.*

*Oleum Theobromatis* (U. S. P.).—Oil of Theobroma, Cacao-Butter.

**Pharmacology.**—The seeds of the Theobroma cacao (Sterculiaceæ) are oval, and consist of shells and kernels, both of which contain an alkaloidal principle called **Theobromine** (about 2 per cent.), analogous to caffeine (the former being dimethyl-xanthine, the latter trymethyl-xanthine), and a yellowish-white, solid oil, or fat, known as **Cacao-Butter**. This has a faint, characteristic, pleasant odor, is almost tasteless, and has a neutral reaction, melting at the temperature of the surface of the body. It is nutritious, but in medicine is chiefly valuable as a basis for suppositories, and for external application in massage. Chocolate is an article of food prepared from the roasted kernels, which are ground into a fine paste with sugar and flavored with vanilla. When this is added to boiling milk in proper proportion, a pleasant restorative article of diet is made, but rather oily, on account of the presence of the cacao-butter. When the cacao-butter is partly removed by pressure and the kernels roasted and ground, as before, it is known as cocoa,—an unfortunate name, since it causes confusion by resembling cocoa, or the cocoanut-tree, and coca, or the erythroxylon coca, the latter also being the source of an exhilarating beverage used in South America. Cacao-butter is chiefly stearin; it does not become rancid. It has recently been ingeniously substituted in a milk food for infants (Lacto-Preparata of Reed and Carnrick) in order to overcome the objection of the deficiency of fat, since in all these preparations most of the cream has to be removed, because it readily becomes rancid and cannot be kept without developing fatty acids. Cacao-butter is largely used in making suppositories, of which the following may be taken as an illustration :—

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|---|---|
| ℞ Ext. krameriæ, | gr. v. |
| Ext. opii, | gr. ss–j. |
| Ol. theobromatis, | gr. xv. |

M. et ft. suppositorium no. j ; mitte tales no vj.
Sig.: Insert one at night for irritable hæmorrhoids.

In preparing suppositories the addition of spermaceti causes the mass to congeal more rapidly and renders it less apt to adhere to the moulds. There is but one official suppository in the United States Pharmacopœia, that of glycerin, which, however, is made with stearic acid and sodium carbonate.

**Copra Oil.**—It has been suggested that this substance may be advantageously used in preparing suppositories. Copra-oil seems to consist of cocoanut-oil (from Cocos nucifera) freed from its more liquid portion. It congeals at 28° C. (82.4° F.) and possesses the advantages of solidifying rapidly, of contracting considerably after cooling in the moulds, and of being able to take up a large proportion of water.

**Physiological Action.**—The physiological effects of theobromine are analogous to those of caffeine, but it does not stimulate the central nervous system to anything like the same extent, and is poisonous only in doses five or six times as great as the latter drug. The effects upon the vaso-motor centre in the medulla are also much less. W. Cohnstein concludes that in physiological doses theobromine has no perceptible action upon the heart, but that excessive quantities cause a gradual fall of blood-pressure. Schrœder[*] demonstrated that caffeine acted as a diuretic by direct stimulation of the renal epithelium, and subsequently has shown that theobromine acts in the same way.[†] He also showed that theobromine was less poisonous, and that it was a more powerful and lasting diuretic. Gram[‡] confirmed these observations, but found theobromine insoluble and likely to cause nausea. He, therefore, recommends a double salicylate of theobromine and sodium, containing about

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[*] *Archiv für Experiment. Pathologie*, xxii, 1886.

[†] *Ibidem*, xxiv, 1887.

[‡] *Therap. Monatshefte*, January, 1890.

50 per cent. of theobromine, as a substitute, which, from its effects, has been called **Diuretin.** This salt has a bitter taste; is a white powder, soluble in half its weight of hot water, and not depositing in cooling. It is best given in solution with an aromatic water; in syrups it is liable to deposit, and in powders it is apt to decompose in a short time. He gave it in 15-grain doses, five or six times daily. The action of diuretin upon the heart very closely resembles that of digitalis. According to the investigations of Panowski, diuretin exerts a tonic influence upon the cardiac muscle and diminishes the area of cardiac dullness even before it produces a diuretic effect. It also raises the blood-pressure. In some instances diuretin occasions disturbance of the digestive system and, in rare cases, skin eruptions follow its use. It also sometimes causes buzzing in the ears, insomnia or drowsiness. In a case which came under the observation of Dr. Höhn, of Radein, the administration of diuretin to a man suffering from emphysema of the lungs, dilatation of the heart and dropsy gave rise to violent headache, giddiness, vomiting, a feeling of anxiety, and excitement.

Gram has also written of a corresponding compound with lithium, a salicylate of theobromine and lithium, or theobromine-lithium. This preparation may effectively take the place of diuretin, being more readily absorbed than the latter and active in doses of 3 or 4 grains.

**Therapy.**—Diuretin has been tried in various diseases by Hoffman,* who gave about 75 grains daily; he found it useful in pleuritic effusion. In acute nephritis the amount of urine was tripled. In disorders of the circulation attending lesions of the heart, Hoffman reports in all great diuresis, decrease in œdema, and strengthening of the pulse. The diuretic action is usually manifested within the first twenty-four hours, and gradually reaches its maximum between the second and the sixth day. It falls rapidly upon discontinuing the drug, or after the disappearance of the dropsy. The amount of albumin in the urine was not much affected, except that in the heart-cases there was distinct lessening. No cumulative effects were observed, and the theobromine was rapidly excreted in the urine. Dyspnœa, bronchitis, anorexia, and general condition were all improved. Sometimes slight diarrhœa was noticed, but the drug was well borne by the stomach. Excitement and sleeplessness did not occur, but as the circulation improved the patient slept better. In some cases, where digitalis and strophanthus had failed to give relief, theobromine acted well, but, as a rule, it is not so generally useful. It may be combined with them in certain cases so as to assist in promoting diuresis. In Hoffmann's opinion it is much superior to caffeine. It has the advantage, over calomel and other mercurials, of acting upon the heart as well as the kidneys.† Diuretin is particularly valuable in the treatment of dropsy dependent upon cardiac failure. According to the observations of Pawinski it is more efficacious in affections of the heart-muscle than in valvular disease. In œdema due to renal lesions it is of value, but is seldom of use in ascites of hepatic origin. In some cases, after having been given for several days, diuretin will produce marked depression. In a case of progressive spinal paralysis Ancona observed that diuretin had a marked effect in regulating the function of micturition, apparently by a direct action on the vesical centre. Dr. Demme regarded diuretin as useful in the treatment of children. It causes a rapid disappearance of dropsy due to scarlatinous nephritis and of anasarca dependent upon cardiac lesion. He found it generally well tolerated, and that it can be given in the daily doses of 7½ to 22 grains to children from two to five years old and in proportionally larger amounts to older children. It is inappropriate, however, to infants less than a year old, on account of the gastro-intestinal irritation which it excites. In one case he witnessed a morbiliform eruption, with abundant diarrhœa, after ingestion of 90 grains within four days. Its action is more enduring than that of digitalin; it is not dangerous like calomel and does not produce nervous excitement like caffeine.

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* *Archiv für Exp. Pathologie*, xxviii, Heft 1, 1890.

† Supplement to the *British Medical Journal*, January 3, 1891.

Cacao-butter is a good emollient and protective to apply to excoriated nipples of nursing women and to the thighs of children suffering with intertrigo.

## THILANIN.

**Pharmacology and Therapy.**—This name has been given to a combination of sulphur with lanolin. The compound, which contains 3 per cent. of sulphur, appears to differ from a mere mechanical mixture. It is as yet uncertain whether the sulphur is combined with the cholesterin or with fatty acids. Thilanin is an unctuous substance, of a yellowish-brown color and a sulphurous odor. It is devoid of irritant properties. In subacute, acute, and chronic eczema, the eczema of children, herpes, and sycosis, thilanin has proved of advantage. It can be mixed with aqueous or oleaginous fluids. This compound has been used with advantage in acne and psoriasis and relieves the itching of various diseases of the skin.

## THIOL.

**Pharmacology and Therapy.**—A chemical composed of hydrocarbons and about 12 per cent. of sulphur. It occurs as a soft, gray powder, or scales, as prepared by Riedel, who also furnishes it in liquid form which contains 40 per cent. of the base. Thiol is of agreeable odor and neutral reaction, is readily soluble in water, but is less soluble in alcohol and ether. It is free from local irritant effect. Dr. Laughin has employed thiol ointment with success in eczema, acne rosacea, carbuncles and boils. In facial erysipelas thiol constitutes an excellent application. A 20-per-cent. ointment is a useful application in frost-bites and chilblains. Thiol is likewise of value in the treatment of burns. The powder is a good application to moist eczema, burns, erythema multiforme and pemphigus. In the liquid form it is of benefit in papular and pustular eczema.

Thiol resembles ichthyol in chemical composition, and it may produce the same physiological and therapeutical effects. It is said to be non-toxic.

Thiol is employed for the same purposes as an antiseptic and local stimulant as ichthyol, over which it has the advantage of being more agreeable in odor.* Professor Schwemmer reports cases of herpes zoster and dermatitis herpetiformis successfully treated with a 10-per-cent. solution of thiol, used twice daily. He recommends it in other erythematous disorders. Dr. Moncorvo has employed it among children for the purpose of diminishing suppuration and removing cutaneous affections, either of parasitic origin, such as tinea and favus, or those due to constitutional disease, such as tuberculosis and syphilis.

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* *Wiener klinische Wochenschrift*, No. 18, 1890.

In the daily dose of about $\frac{1}{8}$ grain, thiol has been successfully given internally for the relief of constipation.

Gottschalk employs thiol in cases of pelvic exudation, acute and chronic endometritis, a 10- to 20-per-cent. glycerin solution being used upon vaginal tampons and the abdomen rubbed once a day with a thiol ointment. To the canal of the womb he applies the remedy upon an applicator. Thiol ointment is irritant to the skin, and its use must be from time to time discontinued.

Another compound in which sulphur is present is known as **Thiophen.** This substance is a hydrocarbon belonging to the aromatic series; is a colorless volatile oil, insoluble in water, and possessed of a slight odor. Two combinations of thiophen have been made the subject of clinical experiment. Sodium sulphate thiophen is a white, crystalline powder containing 33 per cent. of sulphur, half of which is combined with carbon. Its somewhat disagreeable odor is completely lost when it is made into a 5- to 10-per-cent. ointment. The ointment has no irritant effect upon the skin, and has been found beneficial in prurigo.

Thiophen di-iodide has been used as a substitute for iodoform. It is made by replacing two atoms of iodine for two atoms of hydrogen in thiophen. Thiophen di-iodide contains 75.5 per cent. of iodine and 9.5 per cent. of sulphur, both being in combination with carbon. The substance is crystalline, insoluble in water; soluble in alcohol, ether, and chloroform. It inhibits the development of the microbes of suppuration, and has been employed with success in the treatment of wounds and burns. This compound has been successfully employed by Topolanski, combined with sugar, in the treatment of conjunctivitis, catarrh of the lachrymal duct and abscess of the cornea.

**Thio-Resorcinum.**—Thio-resorcin is a sulphur substitution compound of resorcin. It is in amber-yellow crystals, and is used instead of iodoform in minor surgery. It probably might also be used internally, in the same doses as resorcin.

**Thiocamf.**—According to Professor Emerson Reynolds, its discoverer, thiocamf is a liquid which results when sulphur-dioxide gas is brought in contact with camphor. It is of value as an atmospheric disinfectant, an intestinal antiseptic, an application to wounds and a parasiticide in cutaneous affections. Thiocamf has been given internally combined in the proportion of 10 per cent. with pure butter-fat. Of this combination 10 grains were administered in capsule every two or three hours until four doses had been taken. It was thus employed in a number of cases marked by intestinal fermentation. A 4-per-cent. solution in olive-oil proved efficacious in scabies. The same solution, or one a little stronger, was applied with advantage to bed-sores and unhealthy ulcerations, with the effect of rapidly removing fœtor and promoting repair.

## THIOSINAMIN.

**Pharmacology and Physiological Action.**—Thiosinamin, or allyl-sulphocarbamid, is made by heating together 2 parts of allyl-mustard-oil, 1 part of absolute alcohol, and 7 parts of solution of ammonia. It is a white crystalline substance and possesses a slight aromatic odor. This compound dissolves in alcohol in the proportion of 1 part in 5, but is decomposed by solution in water. It is also soluble in ether.

Thiosinamin has been used by hypodermic injection, principally in lupus. It was the subject of a communication by Hans Hebra in August, 1892, to the International Congress of Dermatology and Syphilology. Injections of this substance are said to increase the quantity of urine excreted. They are productive of no injurious effect upon the kidneys. Thiosinamin promotes the absorption of exudations.

**Therapy.**—Subcutaneous injection of thiosinamin causes a local reaction of lupus, manifested by swelling of the diseased surface, continuing for four to six hours, gradually subsiding until, at the end of twenty-four hours, the skin has regained its former aspect. Constitutional symptoms do not occur. As a result of the operation, it is reported that lupous nodules retrocede, ulcers become clean, the elevated edges are leveled, and cicatrization takes place in a few weeks. Thiosinamin promotes resolution of enlarged lymphatic glands, especially in scrofulous or tuberculous subjects. This remedy has been considered as of service in the treatment of caries and necrosis.

It is without influence upon syphilitic lesions. The injections are said to have a decided effect upon corneal opacities. Dr. Latzko has found the absorbent power of thiosinamin of service in gynæcological cases. Injections of 2½ to 10 drachms of a 15-per-cent. solution caused the partial or complete removal of pelvic exudates and allowed malpositions of the uterus to be rectified.

Dr. Hanc, of Vienna, has made trial of thiosinamin in two cases of urethral stricture. He employed the remedy hypodermically, injecting at first half and subsequently a Pravaz syringeful of a 15-per-cent. alcoholic solution. He observed a rapid softening of the cicatricial tissue and an improvement in the symptoms, but the transformation was not permanent and the parts were not restored to the normal condition.

## THUJA.—Thuja, Arbor Vitæ.

**Dose,** f℥ss–j, in fluid extract or tincture (20 per cent.).

**Pharmacology.**—The fresh tops of Thuja occidentalis (Coniferæ), or white cedar,* growing in the Northern United States, contain **Pinipicrin,** a bitter principle; **Thujin,** a yellow coloring principle. **Thujetin** is derived from the preceding. Its most important constituent is a **volatile oil,** which resembles savin in its physiological effects.

**Therapy.**—Externally, the recent leaves have been used, rubbed up with ointment, as a stimulating antiseptic dressing for ulcers and condylomata. A strong tincture may be applied externally, in warts and excrescences, and given internally in 5-minim doses. A drachm of thuja added to an ounce of warm water is said to constitute an excellent injection in hydrocele, the fluid having been previously withdrawn from the sac. In papillomata of various kinds, Dr. Piffard speaks highly of it, and considers it useful in gleet dependent upon granular urethritis. The oil has been given with the view of expelling worms, but should be cautiously used, as it is a gastro-intestinal irritant. It has even brought on abortion in pregnant women, but only does so by the violent disturbance it creates in the gastro-intestinal tract. In bronchitis, the vapor of thuja, steeped in boiling water, often increases expectoration, and has a secondary astringent effect.

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* The Cupressus thyoides, an entirely different tree, is also known by the name of white cedar, and more appropriately.

Thuja has been used both internally and externally, with some success, in chronic rheumatism. In amenorrhœa and prostatitis it has been found of avail, and is said to have been serviceable in intermittent fever. This remedy seems to exert a certain influence upon the growth of malignant tumors, and has been thought to have a special power in restraining the hæmorrhage which they occasion. It has also been employed in hæmoptysis.

The **Oil of Pumilio Pine,** from an allied species, has been used in drachm-doses, given in milk, as a tæniacide. It is pleasant, effective, and apparently a safe remedy.

### THYMUM.—Thyme.

*Preparations*

*Oleum Thymi* (U. S. P.).—Oil of Thyme (principally used externally). *Dose,* ♏i–ij.

*Thymol* (U. S. P.).—Thymol. *Dose,* gr. ss–ij.

**Pharmacology.**—The Thymus vulgaris (Labiateæ), or thyme, is indigenous to Europe, but cultivated in gardens as an herb. The **volatile oil** is official; it has a strong odor, a characteristic pungent taste, a neutral reaction. It consists of two portions, the lighter and more volatile being the hydrocarbons **Cymene** and **Thymene,** the second being chiefly **Thymol,** which is official. It should be quite free from carbolic acid, with which it might be adulterated. Thymol crystallizes in hexagonal forms, nearly or quite colorless; the crystals, when rubbed, develop electricity and attract small pieces of paper.

Thymol has an aromatic, thyme-like odor; a pungent, aromatic taste, with very slight caustic effects upon the lips, and a neutral reaction. It liquefies with camphor. It is soluble in about 1200 parts of water and 900 of boiling water; freely soluble in alcohol, ether, chloroform, benzin, gacial acetic acid, and oils.

Thymol has lately been obtained by two Japanese chemists from the oil of Mosula japonica, a labiate plant. It olso occurs in Monarda punctata (Labiatæ) and Carum ajowan (Umbelliferæ).

**Physiological Action.**—In its effects, the oil of thyme is very much like the oil of peppermint, or origanum, and, in fact, is often commercially substituted for the latter. **Thymol** is a valuable antiseptic; it is less powerful than carbolic acid, but, on the other hand, is ten times less poisonous and much less caustic and irritating.

Thymol paralyzes the end-organs of sensory nerves in the skin and mucous membranes, but is a local irritant, and cannot be used well for the purposes to which cocaine is applied. It is a powerful antiseptic and disinfectant. Internally, in doses of gr. xx–xxx per diem, it causes epigastric heat, sweating, singing in the ears and deafness, and it escapes chiefly by the urine, which is increased, and becomes olive-greenish, as after carbolic-acid poisoning. It lowers arterial tension and reflex action, reduces the temperature, and may cause fatal coma. The nerve-centres of the cord are paralyzed by large doses.

**Therapy.**—Volkman and other surgeons have utilized thymol in antiseptic dressings as a substitute for the more toxic and less agreeable carbolic acid. It has been found a good application in eczema, psoriasis, and ringworm. An ointment containing 10 grains of thymol to the ounce is of service in acne and alopecia circumscripta. The addition of a little alcohol renders it possible to prepare a 1-to-1000 watery solution, which is efficient, and sometimes even needs to be weakened. A thymol solution is a useful injection in leucorrhœa. Thymol has been used both locally and internally, with success, in diphtheria. In solution it has been inhaled with benefit in laryngitis, and in phthisis it disinfects the sputum. In catarrh of the upper air-passages, Dr. Clarence Rice recommends inhalations of the following mixture:—

℞ Menthol.,
Thymol.,
Acid. carbolic., . . . . . . . . . . āā gr. v.
Ol. eucalypti, . . . . . . . . . . . f℥ij.
Ol. pini sylvestris, . . . . . . . . . . f℥iij.
M. A teaspoonful is added to boiling water and the steam inhaled or 20 or 30 drops are placed upon a sponge or piece of cotton.

Thymol has also been administered internally in phthisis. It may be inhaled with advantage in bronchitis, whooping-cough and gangrene of the lung.

Kuessner reported good results from the internal use of thymol in diabetes, vesical catarrh, and infantile diarrhœa. Bufalini states that thymol, given in conjunction with a nitrogenous diet, restrains glycosuria, but is without effect when the patient is upon a mixed diet. Surgeon-Major Lawrie has reported two cases of chyluria of filarious origin successfully treated by means of 1 grain of thymol every four hours, increased gradually to 5 grains. A modification of this method consists in the association of gallic acid and thymol. Nugent has reported a case of chyluria, in which the presence of the filaria was demonstrated in the urine, treated with success by means of 15 grains of gallic acid and 2 grains of thymol thrice daily, the quantities being increased to 20 grains of the former and 5 grains of the latter remedy. Rapid improvement took place, the urine became normal in appearance, and at the end of two weeks was free from chyle and filariæ.

Thymol has been employed with advantage in dentistry by Hartmann, of Münster. He applies it for the destruction of the tooth-pulp, and also in acute pulpitis.

Glycerin is a good vehicle, and, when properly diluted, a glycerite of thymol makes a good mouth-wash. In acute and chronic intestinal disorders, thymol has been employed by a number of clinical observers. Dr. Fred. P. Henry has used thymol, prepared with Castile soap, in gr. ii–iij doses every six hours. He reports that in typhoid fever the temperature falls, the stools become less frequent, cerebral symptoms diminish, and the tongue cleans off and becomes moist. Testi has employed thymol in 150 cases of typhoid. He says that the drug lowers temperature, diminishes tympanites, hinders fermentative processes in the intestinal tract, reduces the excretion of the urea, and increases the blood-pressure, without injury to the heart. Thymol has also been given internally in articular rheumatism.

Campi has used thymol with success as a tæniacide, according to the following method: 5 or 6 fluidrachms of castor-oil are given at bed-time, and the next morning, beginning early, 10 grains of thymol are given every fifteen minutes. The worm is said to be expelled entire.[*] Dr. Sonsino, of Pisa, has never witnessed any good results from the use of thymol as a tæniacide, but states that is of avail in cases of ascaris lumbricoides and especially oxyuris vermicularis. In the latter trouble he administers it by enema.

An infusion of thyme is of service in whooping-cough. It alleviates the paroxysms and shortens the course of the malady.

Jolly has experimented clinically with this product in a number of cases. It was without effect in true migraine, but in other cases of headache proved equal to phenacetine. It induced sleep in 16 out of 26 cases of insomnia, the average dose necessary being 7½ grains.[†]

**Thymus serpyllum**, or wild thyme, is very highly recommended by Dr. Sidney B. Straley, of Andover, N. J., in the treatment of whooping-cough. To that observer it appears to have almost a specific action. A tincture of the green plant is harmless in doses as large as a teaspoonful to a child of 8 years. The remedy is efficient in any stage of the disease, its action is fully established in twenty-four hours and completed in five days.[‡]

**Thymacetin.**—Hoffmann, of Leipzig, has prepared a substance which bears the same relation to thymol as phenacetin to phenol. Thymacetin is a white, crystalline powder, slightly soluble in water, readily soluble in alcohol and sparingly in ether. It melts at 136° C. (276.8° F.). It has been given to dogs in doses of 30 grains without causing symptoms of intoxication. In many cases it causes slight headache lasting for several hours. It increases arterial tension and pulse-rate. In certain instances it gives rise to digestive disorder and gastric catarrh.

### TIGLII OLEUM (U. S. P.).—Croton-Oil.

**Dose,** ♏¼–ij.

**Pharmacology.**—Croton-oil is a fixed oil expressed from the seed of Croton tiglium (Euphorbiaceæ), an East Indian tree of moderate size. It is a pale-yellow, or brownish-yellow, rather viscid, and slightly fluorescent liquid, having a somewhat fatty odor, a mild, oily, afterward acrid, burning taste, and a feebly-acid reaction. When fresh it is soluble in about 60 parts of alcohol; the solublity and therapeutic activity increase by age. It is freely soluble in ether, chloroform, carbon disulphide, olive-oil, and oil of turpentine. It contains **Tiglinic acid**, and also several glycerides of fatty acids.

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[*] Annual of the Universal Medical Sciences, 1890, vol. v, A-136.

[†] See *British Medical Journal*, March 19, 1892.

[‡] *Medical Bulletin*, 1893, p. 190.

**Physiological Action.**—The topical application of croton-oil to the skin causes irritation, inflammation, and a papular eruption, subsequently becoming pustular. Occasionally its application produces a general papulo-pustular eruption, scattered over the body. The pustules afterward dry up, and may give rise to scars if the oil was applied undiluted. The pustules are sometimes umbilicated, and, upon careless examination, the eruption might be mistaken for that of small-pox. When 1 or 2 drops of croton-oil have been swallowed vomiting may be produced, but in the course of an hour or two copious watery stools are passed, with symptoms of irritant poisoning, particularly when larger doses have been taken. Congestion of the gastro-intestinal tract occurs, and death may ensue from resulting inflammation of the bowels or peritonitis. Part of the oil diffuses into the blood, and produces glandular hyperæmia, and possibly an eruption upon the skin. Sometimes, when applied to the skin, the contrary is observed, the remedy passing through into the blood and causing watery discharges from the bowels. When combined with an alkali, or with some other agents, while it promotes the peristaltic action, the effects are more manageable and there is less danger of general toxic effects. It is a feeble hepatic stimulant according to Rutherford. The toxic effects of croton oil are combated by means of demulcent drinks and opiates.

**Therapy.**—Croton-oil was formerly a favorite method of exciting counter-irritation, because it was convenient, simple, and rapid in its effects. On account of the danger of producing suppuration and the resulting scars, it is rarely resorted to at present. If it be diluted with 3 parts of oil of sweet almonds it is a little less prompt, but the resulting inflammation is much milder, and several applications are sometimes required in order to bring out sufficient papules. It is valuable in disease of the chest, in incipient phthisis, pleurisy, bronchitis, neuralgia, rheumatism, and glandular swellings. Sciatica, in particular, has been benefited by this method of treatment.

Counter-irritation by croton-oil is likewise serviceable in chronic laryngitis, ovaritis, and metritis, and in phlegmonous pharyngitis, especially of the relapsing variety, frictions of the upper part of the neck with croton-oil are strongly advised by Dr. Helbing. Dr. Charles Cobb states that half a drop of croton-oil applied daily by means of a probe is an excellent remedy in suppurative tonsillitis. Pustulation of the shaven scalp was formerly esteemed beneficial in meningitis, but is a method of treatment scarcely to be advocated. Its use in ringworm induces an artificial kerion, which soon subsides and the disease disappears. It should not be used for this purpose in delicate children, especially those under 6 or 7 years of age; it should also be applied to a small spot, a little larger than a dime, and it should be used only in chronic cases.

A liniment of croton-oil, official in the British Pharmacopœia, contains 1 part of this oil, 3½ parts of oil of cajuput, and 3½ parts of rectified spirit; 5 minims of this preparation to an ounce of olive-oil is a stimulant application sometimes used in alopecia. In other cases of skin affection occasional small doses of croton-oil are useful in clearing the alimentary canal.

Internally croton-oil is used as a drastic purgative in cerebral affections, apoplexy, etc., acute mania, and in cases of injury to the head. It is serviceable on account of its depletory and derivative effect in uræmic coma. In comatose conditions the dose may be simply dropped upon the tongue, and two or three times the usual dose are required. It is a better plan, however, to dilute the oil with a little lard, butter, sweet-oil or castor-oil. This medicament is valuable as a hydragogue cathartic in the treatment of anasarca, and in many cases where a complete evacuation of the bowels is desired, to bring about prompt diminution of arterial pressure and derivative action. In some instances it would be proper to give croton-oil in obstruction of the bowels from impaction of fæces, lead colic, or paralysis of the intestine. It may also be used as a vermifuge to expel tape-worms, but is so violent that the head is apt to be torn off and remain, unless an anthelmintic has been administered previously. Croton-oil should not be given to a pregnant woman, nor to a patient subject to hæmorrhoids.

**TILIA.—Tilia, Linden-Tree.**

**Pharmacology and Therapy.**—The inflorescence of the linden-tree of Europe (Tilia vulgaris, T. parviflora, and T. grandiflora), natural order Tiliaceæ, has a faint but pleasant odor and sweetish taste. The flowers are employed in making an aromatic water, which is used as a vehicle, in France especially.

**TOLUTANUM.** See Balsamum Tolutanum.

**TONGA.**

**Dose**, gr. xx–ʒj, in fluid extract.

**Pharmacology.**—A drug from the Fiji Islands, composed apparently of a mixture of several varieties of barks and roots, which are arranged in bundles. Drs. Ringer and Murrell, having made a series of experiments, which were reported in 1880, recommended it to the profession for further trial. It was supposed to be derived principally from the Raphidaphora vitiensis (Schott), a creeping-plant of the order Araceæ, and Premna taitensis (Schauer), a small tree of the natural order Verbenaceæ. A volatile alkaloid, **Tongine**, has been isolated from the former; the latter contains some volatile oil. The fluid extract, as made by Parke, Davis & Co., of Detroit, represents the therapeutic properties of this new drug.

**Physiological Action.**—Beyond slight drowsiness, Ringer and Murrell observed no systemic effects from an ounce and a half of the fluid extract, given within three hours. The pupils and the secretion of the mouth and skin were unaffected. The sensibility of the skin supplied by the fifth nerve remained unaltered. They saw no influence upon the pupil from a topical application. Dr. C. Bader states that the alcoholic extract, dropped into a healthy eye, seemed to increase the power of accommodation, without affecting the size of the pupil. He remarked, however, that in some cases large doses, taken internally, caused great dilatation of both pupils. Dr. T. H. Streets, U. S. N., reports the experience of himself and several colleagues. They found a decided diminution in the excretion of urea from 1-ounce doses, but no increase in the quantity of uric acid. The pulse, temperature, and pupils were unchanged. Two of the four experimenters noticed a tendency to cerebral congestion of short duration; one was slightly purged. The symptoms disappearad in about two hours, leaving no after-effects.

**Therapy.**—From the claims made by its introducers, it was thought that tonga would be a valuable addition to the list of antineuralgic remedies; but the attempt of a London drug-house to make a monopoly of the drug, which was defeated by a lawsuit, probably interfered with its use by the profession. In order that it should gain a secure position among remedies, it would be necessary to exercise supervision over the source of supply, so that it shall be of uniform strength and quality. Tonga is of marked service, however, in the treatment of neuralgia, especially when it involves branches of the fifth nerve. It has relieved pain in a large majority of the cases in which it has been employed. The fluid extract should be given in 1-drachm doses, and repeated at intervals of about two hours, while needed. Tonga is rather slow in its actions, and it requires about two hours for the full effects of the drug to be manifested. Dr. Bader has seen good results from the local use of tonga in asthenopia, rheumatic iritis, and photophobia.

**TOXICODENDRON.** See Rhus Toxicodendron.

## TRAGACANTHA (U. S. P.).—Tragacanth.

### *Preparation.*

*Mucilago Tragacanthæ* (U. S. P.).—Mucilage of Tragacanth.

**Pharmacology.**—Gum tragacanth is the product of trees growing in Asia Minor and Persia. It is a gummy exudation from Astragalus gummifer, and from other species of Astragalus (Leguminosæ). It is in white, flattened bands, which, in drying, become curled or twisted, and are afterward broken in small pieces. It is horn-like, or translucent; and, when moistened with water, it is converted into a gelatinous mass. It consists of **Arabin, Bassorin,** and a little starch. Tragacanth paste is adhesive, and is used in practical pharmacy to paste labels on bottles, boxes, etc. It is also the basis of most of the official troches, and is of service in emulsions for the suspension and division of various powdered drugs, and for codliver-oil.

**Therapy.**—Only used in medicine, other than already stated, as a demulcent in pharyngitis, gastritis, and inflammation of the bowels. Large amounts do not agree with the stomach, unless some antiseptic agent, like creosote or naphthol, is administered at the same time, to prevent fermentation. It contains a little starch, and has slight nutritive properties.

Dr. George T. Eliot, of New York, has introduced bassorin as a base for the application of medicaments to the integument. Bassorin is a demulcent substance, tasteless and odorless, converted into a viscous mass by the addition of hot water. When mixed with water, glycerin, and dextrin, a bassorin paste is obtained, of jelly-like consistence and light-yellow color. This paste is neutral, undergoes no alteration, does not stain the skin or clothing, adapts itself perfectly to the affected surface, and may be readily removed at any time by the aid of water. Solid substances can be incorporated with bassorin paste in any desired proportion. Fluid preparations render it too liquid, while alcoholic solutions cause it to become hard and brittle.

M. Vindevogel recommends that, in preparing ointments containing large proportions of extracts or salts, 2 grammes of powdered gum tragacanth be added for each gramme of the water employed in dissolving the salt or extract. The fatty body is added after trituration, and by this method a homogeneous ointment of good consistence is made. In case, however, absorption of the unguent is desired, the bassorin of the gum proves a disadvantage.

### TRIFOLIUM PRATENSE.—Red Clover.

**Dose,** ʒi–ij, in fluid extract or infusion.

**Pharmacology.**—The flower-heads of red clover, or Trifolium pratense (Leguminosæ), are fragrant and sweetish, containing a flavoring principle and sugar. The fluid extract and infusion are both employed.

**Physiological Action.**—It is considered diuretic and alterative.

**Therapy.**—The infusion of clover-tops is given to children suffering with whooping-cough, with good results. The fluid extract, containing alcohol, is employed externally in domestic practice for wounds and ulcers. A compound syrup of red clover, containing red clover, gr. xxxij; stillingia, gr. xvj; berberis aquifolium, gr. xvj; prickly-ash bark, gr. iv; burdock-root, gr. xvj; poke-root, gr. xvj; cascara amarga, gr. xvj; potassium iodide, gr. viij, in each fluidounce of the syrup, has been furnished to meet professional demands by Parke, Davis & Co., to take the place of several proprietary preparations of uncertain composition. It is useful as an alterative in syphilis, struma, and some chronic forms of skin disease.

### TRILLIUM.—Trillium, Beth-Root.

**Dose,** ʒi–ij, in the form of fluid extract.

**Pharmacology.**—The Trillium erectum (Liliaceæ), growing in woody places in the Northern United States, contains in its rhizome an acrid principle, with tannin, etc.

**Physiological Action.**—It is astringent, tonic and antiseptic.

**Therapy.**—In genito-urinary affections, hæmaturia, and pulmonary affections, trillium is used in the form of a fluid extract, which is also used externally for wounds.

### TRIMETHYLAMINI HYDROCHLORAS.—Trimethylamine Hydrochlorate.

**Dose,** gr. iii–x.

**Pharmacology.**—Trimethylamine, with dimethylamine and tetramethylammonium hydrate, are compound ammonia bodies, discovered by Hoffmann. Dimethylamine is a combustible gas. Trimethylamine is also a gas at ordinary temperatures, with a strong ammoniacal odor and an intense alkaline reaction; with methyl iodide it forms a salt which, being treated, in solution, with silver oxide, yields silver iodide and tetra-methylammonium hydrate. The latter body, being subjected to dry distillation, decomposes into trimethylamine and methyl alcohol. Trimethylamine, $(CH_3)N_3$, exists already formed in Arnica montana, Chenopodium vulgaris, in the flowers of Cratægus oxyacantha, in ergot, in codliver oil, and in various decomposing albuminous compounds, particularly herring-brine, guano, urine, and coal-gas tar. Vincent extracted large quantities from the residue of the distillation of fermented beet-juice, or the refuse left after making beet-sugar. Propylamine is usually an impure trimethylamine in solution; the name properly belongs to another, though similar compound. Trimethylamine hydrochlorate is a comparatively stable salt and has been used in medicine.

**Physiological Action.**—Trimethylamine hydrochlorate, in strong solution, acts as a caustic; when applied to the lip it causes a burning sensation and the epithelium afterward exfoliates, leaving a superficial ulcer. Internally, it acts as an irritant to the digestive tract, and to its local action Dujardin-Beaumetz ascribes the cause of the fatal result from a large dose; he states, however, that as much as 75 grains may be given without fatal effect. Doses of about 20 grains, repeated several times, cause, in rabbits, general distress, tremor, with loss of motive power, hyperæsthesia, and increased reflex excitability; the same amount injected under the skin produces death. In the human subject, the first effect, from moderate doses, is increase of the heart's action, but soon, especially if full doses are given, the opposite condition is set up; the pulse-rate and temperature are lowered. No colic or diarrhœa occurs, but the odor and taste are so unpleasant that the remedy is often rejected by the stomach. No increase of perspiration or of the urine is reported.

Combemale and Brunelle state that trimethylamine provokes an excessive secretion of salvia and increases the alkalinity of that fluid. The nasal and lachrymal secretions are augmented and a slight albuminuria is produced. Dujardin-Beaumetz states that the excretion of urea is diminished by the drug. Fatal narcosis may occur from retention of carbonic-acid gas in the blood, but Phillips ascribes death more commonly to the depressing effects of the remedy upon the spinal cord.

**Antidotes to Toxic Action.**—The proper treatment of poisoning would be by external heat, and counter-irritation by mustard or turpentine, and opium and belladonna or atropine to control the symptoms. The tincture of capsicum, with digitalis, strophanthus, or nux vomica, would be useful in counteracting the effects upon the circulation.

**Therapy.**—This drug was introduced for the purpose of treating acute rheumatism, and in cases with high temperature and active circulation it has produced good effects. It has also been used as an antipyretic in other maladies, in doses of 2 grains repeated every three or four hours. It should be given in capsules or in solution with peppermint-water, well diluted. Trimethylamine is of service sometimes in chronic rheumatism, in which it has been also used as a liniment, 1 part being mixed with 3 parts of glycerin. It has been administered in gout.

### TRITICI FARINA.—Wheat-Flour.

**Pharmacology.**—The Triticum vulgare (Graminaceæ), or wheat, is a well-known source of food. The farina is a fine, white flour, prepared from the seed; it is impalpable, inodorous, and of insipid taste. It consists of starch, 70 per cent.; gluten, 12 per cent.; fixed oil, 2 per cent.; together with cellulose, sugar, and water. It yields about 2 per cent. of ash, containing 50 per cent. phosphoric acid. It is highly nutritious, and contains a large amount of nitrogenous matters. With cold water, it forms a granular, pasty mass, not very adhesive; but, with hot water, the starch-granules swell up and burst, making a homogeneous, jelly-like mixture.

**Physiological Action.**—It is bland and unirritating, and forms a good antidote, when mixed with water, in case of corrosive poisoning. The starch is antidotal to iodine and its preparations.

**Therapy.**—Wheat-flour dusted upon an inflamed surface coats it over with a layer which protects it from the air. It is a convenient application to recent burns and scalds, or erysipelas; but in hot weather it should be associated with some antiseptic to prevent the development of insects, the ova or larvæ of which very often find their way into flour, especially if exposed to the air. It has been asserted that a tablespoonful of flour, in a glass of cold water, swallowed night and morning, will check the development of boils. As the basis of bread, wheat-flour enters into the question of nourishment for the sick, which belongs more to the province of the nurse than the physician, although the medical attendant should be perfectly familiar with the digestive and nourishing qualities of any preparation which may be submitted to his judgment, in order to pronounce upon its fitness, or the reverse, for the patient.

### TRITICUM (U. S. P.).—Couch-Grass.

**Dose,** ʒi–iv, in infusion or fluid extract.

**Pharmacology.**—The rhizome of Agropyrum repens (Gramineæ). It should be gathered in the spring and deprived of its rootlets. It is a common perennial, growing in the fields, and regarded as a weed. The rhizome contains **Triticin,** a gum, sugar (22 per cent.), but is devoid of starch and resin.

**Physiological Action.**—It is demulcent and diuretic.

**Therapy.**—Triticum may be given, in decoction, as a demulcent drink in fevers. This preparation, or the fluid extract, is useful in irritability of the bladder and chronic cystitis. In the latter affection, Sir Henry Thompson recommends a pint of the infusion or decoction, to be taken during the day. In chronic cystitis, irritable prostate, and in gleet, the writer has prescribed the following with triticum:—

| | |
|---|---|
| ℞ Ext. tritici fl., . . . . . . . . . . . | fʒiij. |
| Tinct. belladonnæ, . . . . . . . . . . | ♏lxxij. |
| Sodii bicarbonatis, . . . . . . . . . . | ʒij. |

M. Sig.: A teaspoonful in water every two or three hours.

The following combination relieves irritable bladder or cystitis in women:—

| | | |
|---|---|---|
| ℞ Potassii citratis, | | ℥ss. |
| Extr. tritici fl., | | |
| Tinct. belladonnæ, | āā | f℥j. |
| Extr. buchu fl., | | f℥ss. |
| Aquæ, | q. s. ad | f℥iv. |

M. ft. sol.
Sig.: Teaspoonful in a wineglassful of water three times a day.

Tincture of hyoscyamus may be substituted for the tincture of belladonna.

The fluid extract is a pleasant, malt-like preparation, has some nutritive properties, and possibly may be of value in chronic bronchial disorders. The decoction is one of the many popular remedies for consumption.

**TUBERCULINUM.—Tuberculin, Koch's Lymph.**

The course of speculation and experiment has, for a number of years past, been directed toward the possibility of preventing or curing a disease by the injection of certain specific chemical substances produced by the development of the causative bacillus of the disease. The subjects of immunity, prophylaxis, and cure have been earnestly studied in connection with various infectious diseases, notably tuberculosis, pneumonia, and tetanus. A therapeutical method which seeks to arrest the progress of tuberculosis, especially when proposed by so eminent a man as Professor Koch, challenges the attention of the medical mind. The first edition of this work, therefore, contained a brief account of tuberculin, then recently introduced and undergoing the ordeal of clinical experimentation. The undoubted reaction which, in the vast majority of tuberculous cases, followed the injection of this potent fluid was described, together with the method of its therapeutical application, the evil consequences which had already been noticed in some instances, and the contra-indications to its employment. The writer was impressed by the thought that, whatever be the fate of this particular fluid as a medicinal agent, it was, at any rate, a step forward upon the path which shall lead us to a clearer comprehension of infectious processes, their limitations, or their cure. The fact that tuberculin does not destroy the bacilli of the disease, but occasions their dissemination, was recorded as throwing grave doubt upon the ultimate efficacy of the proposed method. The period had evidently not yet arrived, as the author had already written,* to express a decided opinion regarding the efficacy of the new fluid. Improvement was undoubtedly produced in cases of lupus and in the first stage of pulmonary disease. Would, however, the amelioration endure, or would it be but temporary? Such questions could manifestly not be answered at that date. Some years, however, have now elapsed, and our fears have been realized. Though improvement often followed injection of the lymph, relapses have been the rule, continued amendment the exception. Though powerful, the fluid has been found not infallible as a diagnostic agent, since in some cases of tuberculosis it fails to excite reaction, while constitutional effects have at times followed its use in other diseases. Cases in which the author employed the fluid were certainly remarkably benefited for a time, but one and all have relapsed, and are now in about the same condition as they would have been under the usual approved methods. This experience, which is common to the writer and many other observers, applies equally to cutaneous, glandular, articular, and pulmonary tuberculosis.

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* *Medical Bulletin*, January, 1891, p. 27.

The failure of tuberculin, however, should not lead us to overlook a significant fact. It is not merely a powerful, even poisonous, fluid, but it has the peculiarity of exerting a specific action upon tuberculous tissue. The problem is therefore suggested, whether its toxic principles can be eliminated, and only those retained which act specifically, and it may be beneficially, upon affected parts?

**Tuberculocidin.**—Professor Klebs, of Zürich, has endeavored to solve this problem by separating from crude tuberculin toxic bodies, leaving in solution an albumose, which may be extracted by alcohol, and which he conceives represents the beneficial properties of crude tuberculin. It can be safely employed, both in animals and men, in much larger doses than Koch's lymph. Professor Klebs has often administered 0.5 to 1 cubic centimetre to tuberculous men without the production of notable increase of temperature. Large doses of tuberculocidin may give rise to a slight febrile reaction, which soon, however, subsides. The substance is believed to occasion an irregular, horny degeneration of the bacilli. Professor Klebs has treated local tuberculosis, especially laryngeal, by means of tuberculocidin with very encouraging result. In a series of seventy-five cases of pulmonary disease, he estimates 18.6 per cent. as cured and 60 per cent. as improved. An incidental advantage of this method is, that the patient can generally pursue his occupation uninterrupted by the treatment.*

Langermann reports unfavorably of the action of tuberculocidin in four cases. In three patients no sign of improvement was manifested in consequence of the injections. In one case amendment appeared at first to take place, but the condition soon became aggravated and the case went on to a fatal termination.

## TUMENOL.

**Pharmacology and Therapy.**—This is the name given to a substance discovered by Spiegel. Like ichthyol, to which it is allied, it is derived from mineral oils, its title pointing to its origin from bitumen and oleum. The impure mother-substance occurs among the unsaturated hydrocarbons of the oils, and is separated by the addition of sulphuric acid, a process of sulphonation taking place, with the production of a compound consisting of tumenol-sulphon and tumenol-sulphonic acid. It is the latter of these substances which has been used clinically by Neisser in the form of powder, solution in sulphuric acid and alcohol, as an ointment or plaster. It was found serviceable in acute eczema, burns, ulcers and paræsthesia.

## TUSSILAGO.—Tussilago, Colt's Foot.

**Dose**, ʒi–ij, in decoction or fluid extract.

**Pharmacology.**—The leaves of Tussilago farfara (Compositæ), growing in cold, clayey banks, in the Northern and Middle States, contain **mucilage**, tannin, and a **bitter extractive.**

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* See "Die Behandlung von Tuberkulose mit Tuberculocidin." Vorläufige Mitteilung von Prof. Dr. E. Klebs in Zürich. Fünfte Auflage, Hamburg und Leipzig, Verlag von Leopold Voss, 1892, and *Medical Bulletin*, July, 1892, p. 285.

**Physiological Action.**—Tussilago is demulcent, tonic, and, as the name indicates, it is also deemed expectorant or pectoral.

**Therapy.**—In cough attending chronic pulmonary affections, chronic bronchitis, etc., colt's foot is used, often in combination with licorice, or horehound. The fresh leaves are applied in the form of a poultice to scrofulous ulcers. The fluid extract is a stomachic, and has some tonic properties, owing chiefly to the alcohol which it contains.

### ULMUS (U. S. P.).—Elm.

*Preparation.*

*Mucilago Ulmi* (U. S. P.).—Mucilage of Elm (dried bark 6, boiling water 100 parts).

**Pharmacology.**—The inner bark of Ulmus fulva (Urticaceæ), or elm, a handsome forest tree of North America, contains **mucilage** principally.

**Physiological Action.**—Elm-bark is used as a demulcent externally and internally. The dried bark, in flat pieces or strips, is sometimes chewed, as the taste is not unpleasant, and the mucilage moistens the mouth and throat.

**Therapy.**—Poultices of ground elm bark, with lead-water, are serviceable in erysipelas and various forms of local inflammation; they are used cold or hot. Internally the mucilage may be given *ad libitum* in stomach and bowel disorders, and in painful affections of the urinary passages, dysuria, etc. Pieces of elm-bark, of suitable size and shape, may be made into tents for the dilatation of fistulæ, and in the treatment of uterine affections.

### URANIUM.

*Preparations.*

*Uranii Nitras.*—Uranium Nitrate. *Dose*, gr. i–xx.
*Uranii et Quininæ Chloridum.*—Uranium and Quinine Chloride. *Dose*, gr. i–x.

**Pharmacology and Therapy.**—The salts of uranium, a rather rare metal, have not until recently been used in medicine. At the sixty-third meeting of the British Medical Association, Dr. Samuel West read a paper describing his experience with the nitrate and the double chloride of uranium and quinine. In high doses these salts are irritant and occasion gastro-enteritis. They exert an inhibitory influence on amylolytic and proteolytic action. They were employed therapeutically by Dr. West in several cases of diabetes mellitus. They relieved the subjective symptoms and reduced the amount of sugar excreted. It was found that doses of 10 or 20 grains thrice daily were well tolerated, though it was thought that after the drug had produced a decided effect the doses could be decreased.*

The action of these preparations will merit further clinical investigation.

### URETHAN.—Urethan. ($C_2H_5O$, $NH_2$, CO.)

**Dose,** gr. viii–ʒj.

**Pharmacology.**—Urethan is a recently-introduced hypnotic. It is the ethylic ether of carbaminic acid, and is in the form of tasteless, white crystals. Urethan is soluble in water, alcohol, ether, chloroform and glycerin. The aqueous solution is of a neutral reaction.

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* *British Medical Journal*, August 24, 1895.

**Physiological Action.**—Von Jäksch* found it markedly hypnotic in doses of 7½ to 15 grains in various pathological conditions. Urethan is not an analgesic, and does not relieve the neuralgic pains of locomotor ataxia, for instance. It is considered unsuitable for alcoholic delirum or insanity, since we have agents better suited to control these conditions.

**Therapy.**—In adults, it is recommended for use as a sedative and hypnotic, where other agents cannot be used, in doses of gr. xv, or less, every two hours. Demme regards it especially suited to children, giving 4 grains at the age of 1 year as a true hypnotic. He considers that larger doses are safe even in weakly children, as he has seen no effect upon the circulation, respiration, digestion, or nerve-centres. As an enema, he used it successfully in eclampsia. Abbott reports a case of tetanus cured in two days, from 9 grains of urethan every two hours, with 30½ grains administered at night.

Maresti, also, successfully treated a case of tetanus by means of urethan. Crozer Griffith looks upon urethan, in ordinary dose, as an uncertain and unreliable hypnotic, though in large dose it may at times prove useful.† Chloral and urethan may be combined, forming **Chloral-Urethan**, or **Somnal.** **Uralium**‡ appears to be a similar substance to, if not identical with, somnal. Uralium is a crystalline substance, soluble in alcohol and ether, but insoluble in cold water. It has been given as a hypnotic in doses varying from 15 to 45 grains.

**USTILAGO.—Corn-Smut, Corn-Ergot.** (See Maidis Ustilago.)

**UVA URSI** (U. S. P.).—**Uva Ursi, Bearberry.**
**Dose,** ʒi–ij.

*Preparations.*

*Extractum Uvæ Ursi* (U. S. P.).—Extract of Uva Ursi. *Dose*, gr. v–xv.

*Extractum Uvæ Ursi Fluidum* (U. S. P.).—Fluid Extract of Uva Ursi. *Dose*, fʒss–j.

*Decoctum Uvæ Ursi.*—Decoction of Uva Ursi (1–17). *Dose*, f℥ss–ij.

**Pharmacology.**—The leaves of Arctostaphylos uva ursi (Ericaceæ), or Bearberry, a small herb of North America and Europe, contain **tannic** and **gallic acids,** to which they owe their astringency. Three principles have been separated, **Arbutin, Ericolin,** and **Ursone,** the latter being tasteless, the others bitter and crystallizable, soluble in water and alcohol.

**Physiological Action.**—The preparations of uva ursi are astringent, and in proper dose carminative and tonic, but may constipate the bowels. The astringent principles pass off by the kidneys and are sedative to the urinary passages. An overdose of uva ursi produces vomiting, purging, and genito-urinary irritation, with, sometimes, vesical tenesmus and hæmaturia.

**Therapy.**—The infusion or decoction of uva ursi is a valuable agent in treating irritation of the badder, strangury, dysuria, pyelitis, or cystitis. It may be combined with an alkali as follows:—

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* Jahresbericht der Pharm. Therap., 1885.

† Annual of the Universal Medical Sciences, 1889, vol. v, p. A–150.

‡ *Gazetta degli Ospitali*, Milan, February 6, and *British Medical Journal*, March 16, 1890.

℞ Sodii bicarbonat., . . . . . . . . . . f℥ ij.
Decocti uvæ ursi, . . . . . . . . . . . f℥ viij.
M. Sig.: Take a tablespoonful every two hours for vesical irritation, or in the strangury following the use of a blister.

Uva ursi has some reputation in calculous affections, gravel, etc. **Arbutin** is used in doses of gr. ii–v as a diuretic in dropsy, and also in urethritis. Arbutin appears to be devoid of toxic properties and communicates to the urine a greenish hue, which grows darker if the fluid is allowed to stand. This change of color seems to be due to a partial decomposition of arbutin into glucose and hydrochinone. The chemical change probably occurs in the kidneys. According to Lewin arbutin is the active principle of uva ursi. Dr. Menche has given arbutin in daily doses of 12 grains with decided advantage in cystitis.

It has been asserted by Dr. Harris, of Alabama, that uva ursi causes uterine contractions, and can be used as a substitute for ergot, but further observations are needed to establish its value in this direction. Uva ursi has been given with success in leucorrhœa, menorrhagia, chronic dysentery, and bronchorrhœa, and is reported to have been beneficial in diabetes.

### VACCINIUM VITIS IDÆA.—Cowberry.

**Pharmacology and Therapy.**—Vaccinium vitis idæa, cowberry, is a plant which grows in various European countries and in New England. It has long had a popular reputation in Russia as a remedy in rheumatism. An investigation of its properties has led two Russian physicians, Drs. T. Hermann and S. Smirnow, to conclude that the plant really possesses value in both acute and chronic articular rheumatism. It was given in the form of a decoction of the entire plant (2 to 4 drachms to 6 ounces of water), the entire quantity being taken in the course of the day.

Professor Winternitz, of Vienna, has successfully employed an extract of bilberry (Vaccinium myrtillus), in affections of the mouth, bronchi, kidneys and bladder, and in diabetes. Dr. Weil, of Berlin, asserts that he has used it with advantage in the treatment of diabetes mellitus. A decoction of bilberry fruit has been used with favorable effect as an injection in chronic gonorrhœa.

### VALERIANA (U. S. P.).—Valerian, Valerian-Root.

**Dose,** gr. x–xxx.

*Preparations.*

*Extractum Valerianæ Fluidum* (U. S. P.).—Fluid Extract of Valerian. *Dose*, f℥ ss–j.

*Oleum Valerianæ.*—Oil of Valerian. *Dose*, ♏ii–v.

*Tinctura Valerianæ* (U. S. P.).—Tincture of Valerian (20 per cent.). *Dose*, fʒ i–ij.

*Tinctura Valerianæ Ammoniata* (U. S. P.).—Ammoniated Tincture of Valerian (powdered valerian-root 20, aromatic spirit of ammonia, to make 100 parts). *Dose*, fʒ i–ij.

The official valerianates are of ammonia, iron, quinine, and zinc.

**Pharmacology.**—The rhizome and roots of Valeriana officinalis

(Valerianaceæ), a native of Europe, but cultivated in this country. The root contains a **volatile oil,** which was formerly official, and by oxidation yields **Valerianic acid.** When the drug is recently dried it contains more volatile oil and less valerianic acid; as it gets older, the oil decreases and the proportion of valerianic acid increases, while the odor becomes more marked. Valerianic acid is a colorless, oily fluid, with an odor resembling that of the drug, and a strongly acid and burning taste. It also contains **Valeren,** which is a terpine, and valerian camphor, with resin and water, constituting **Valerol,** which is changed by contact with air into valerianic acid. An alkaloid has been extracted from valerian-root by M. Waliszewski, of Clichy, and named **Chatinine** by its discoverer, in honor of M. Chatin, late Director of the School of Pharmacy of Paris. The same chemist has also isolated a second alkaloid termed **Valerine.** Valerianic acid may be made artificially by the oxidation of amylic alcohol, and it is from this acid that the valerianates are formed; but it does not quite correspond with the natural acid in its physiological effects. The oil is the best form of the drug, and can be given in cinnamon-water and mucilage. The ammoniated tincture is a valuable preparation, owing to the stimulating and carminative effects of the ammonia. The valerianates are rarely used, as their effects do not correspond with those of valerian. An elixir of ammonia valerianate, however, is an excellent preparation when well made, the odor and taste of the salt being covered by the addition of vanilla and a little chloroform; it contains 2 grains to the fluidrachm, and is given in tablespoonful doses. In this a certain part of the result must be attributed to the alcohol which it contains.

**Physiological Action.**—Valerian is anti-spasmodic and slightly stimulating to the circulation. It reduces irritability and reflex contractions, and is a sedative to the spinal cord. In small quantities, valerian excites a sensation of warmth in the stomach, improves the appetite and digestion. Bouchard states that valerian materially decreases the amount of urea excreted. Large doses cause nausea and vomiting, diarrhœa, frequent micturition, tenesmus, increased discharge of urates, with giddiness, hallucinations, and mental disturbance, the oil being a paralyzing agent to the great nerve-centres. Elimination takes place through the kidneys, lungs, and skin.

**Therapy.**—There are no local applications, and the internal use has practically become limited to the treatment of nervous disorders in women, especially nervous headache and hysteria, or hystero-epilepsy. The following prescription, containing valerian, is serviceable:—

℞ Tinct. ammon. valerian.,
Spiritus ætheris comp.,
Tinct. humuli, . . . . . . . . . . āā f℥ij.
M. Sig.: Two teaspoonfuls in water, every hour or two.

The various nervous disturbances which occur at the menopause are relieved by the administration of valerian. This remedy is also of service in pruritus dependent upon disorder of the nervous system. Valerian is of advantage in allaying the nervous phenomena of exophthalmic goitre. Favorable reports have been made of its utility in diabetes insipidus and mellitus. The improvement, however, does not continue. In various spasmodic disorders in children, such as convulsions or chorea due to worms, nervous cough, whooping-cough, and in delirium with depression, it has been beneficially employed. The oil has been given to arouse patients from coma during the progress of a fever, like typhus. Morphine valerianate is sometimes used with the idea that it is better borne than the official salts. Zinc valerianate has been used in nervous diseases, chorea, epilepsy, and neuralgia, in doses of gr. ii–iij, with considerable success.

### VANILLA (U. S. P.).—Vanilla.

#### *Preparation.*

*Tinctura Vanillu* (U. S. P.).—Tincture of Vanilla (10 per cent.), used for flavoring.

**Pharmacology.**—Vanilla is the fruit of Vanilla planifolia (Orchideæ), a native of tropical America. The fruit appears in market in bundles of about fifty pods, six to ten inches long, dark-colored, one-celled, containing a blackish pulp, in which are imbedded numerous very small black seeds, and some crystals of the characteristic principle **Vanillin** (about 2 per cent.), which is the methyl ether of pyrocatechuic aldehyde. Mexican vanilla is the best. The odorous active principle is soluble in alcohol; the pulp also contains fixed oil, sugar, resin, etc. Vanillin has been made synthetically.

**Therapy.**—Vanilla is used in flavoring troches and in making articles of food for the sick. It is added to chocolate during the preparation of this article for the market. It is an aromatic, and probably exerts some stimulating effects upon the human organism, which would make it serviceable in nervous affections. Some persons are more influenced by it than others. Vanilla is said to have aphrodisiac properties.

Vanillin possesses stimulant and tonic properties and has been recommended as appropriate to the treatment of dyspepsia.

Workmen exposed to the dust of vanilla are frequently attacked by papular eruptions upon exposed parts of the body, accompanied by itching and swelling, and followed by desquamation. Coryza and conjunctivitis are also produced by the same cause. Other effects which have been observed are anæmia, headache, giddiness, irritability of the bladder, nervousness and sexual excitement.

### VERATRINA (U. S. P.).—Veratrine.

#### *Preparations.*

*Oleatum Veratrinæ* (U S. P.).—Oleate of Veratrine (2 per cent.).
*Unguentum Veratrinæ* (U. S. P.).—Veratrine Ointment (4 per cent.).

**Pharmacology.**—Veratrine is a mixture of alkaloids prepared from the seeds of Asagræa officinalis, Liliaceæ. Veratrine is readily soluble in alcohol, chloroform and ether; in water it dissolves in the proportion of 1 part to 1500.

**Physiological Action.**—This agent is very irritating to mucous membranes; it powerfully depresses the heart's action, reduces the temperature, and causes fatal collapse. It lowers the sensibility of the sensory nerves. The topical application of veratrine may give rise to erythema, pustules or petechiæ.

**Therapy.**—It is not used internally; but, applied to the affected spots, in the form of oleate or ointment, it quickly relieves neuralgic and myalgic pains. Veratrine ointment mitigates the pain of herpes zoster, and is used in weakened form in infantile paralysis, for the purpose of promoting the nutrition of the affected muscles. This preparation is beneficially applied in cases of chronic swelling and stiffness of joints, and to the affected articulations in the beginning of a paroxysm of gout. Veratrine ointment is useful in pleurodynia or chronic pleurisy, alopecia circumscripta, chloasma, and pediculosis. For ordinary use the official ointment is too strong, and should be reduced once or twice. Care should be taken not to introduce any of the ointment into the eyes, or violent conjunctivitis may be set up. The effects should be carefully watched, also, when this ointment is applied upon or near an abraded or denuded surface.

Veratrine has been given internally in rheumatism, neuralgia, etc., in doses of gr. $\frac{1}{50}$–$\frac{1}{12}$, but is too depressing. Taylor records that alarming symptoms have been produced by $\frac{1}{16}$ grain of veratrine.

## **VERATRUM VIRIDE** (U. S. P.).—**Veratrum Viride, American Hellebore.**

*Preparations.*

*Extractum Veratri Viridis Fluidum* (U. S. P.).—Fluid Extract of Veratrum Viride. *Dose*, ♏i–xl.

*Tinctura Veratri Viridis* (U. S. P.).—Tincture of Veratrum Viride. *Dose*, ♏iii–f ʒ j.

**Pharmacology.**—The rhizome and roots of Veratrum viride (Liliaceæ) are official. It is an indigenous plant; from its place of growth being called swamp-hellebore, also Indian poke, or poke-root, but is an entirely different species from phytolacca, which yields the poke-berries and poke-root of the pharmacopœia. Veratrum-viride root contains **jervine, pseudo-jervine,** and **cevadine,** principally; but traces of **rubi-jervine, veratrine,** and **veratralbine** are also found. Veratroidine, which was formerly regarded as one of its constituents, is thought by Brunton to be, in all probability, simply rubi-jervine with resin. Jervine has not been used medicinally, but would probably prove valuable, as it does not produce vomiting. It forms crystallizable salts with acids.

**Physiological Action.**—The action of veratrum viride is due to the jervine and other alkaloids which it contains. In small doses of the fluid extract, the pulse is lowered in force, without at first affecting its frequency; it afterward becomes slow, soft, and moderately full, and liable, upon the patient making any exertion, to become rapid, small, and even imperceptible. Nausea and vomiting frequently occur, with much muscular weakness. Large doses bring on a condition of collapse, with retching, cold and clammy skin, imperceptible pulse, intense muscular weakness, giddiness and gradual loss of consciousness. **Jervine** was found by Dr. H. C. Wood to greatly lessen the functions of the spinal cord and medulla, especially the vaso-motor centre, and at the same time to cause convulsions by irritation of motor centres in the brain; the principal effects being shown in muscular weakness, followed by tremors, lowered blood-pressure, and slow pulse. Bartholow attributes death to asphyxia from paralysis of muscles of respiration, and considers the cerebral effects to be due to the accumulation of carbonic acid in the blood. It is possible that the convulsions may really be due, in part, to cerebral anæmia, and death may occur from syncope. An erythematous or pustular eruption will sometimes follow the internal employment of veratrum viride.

**Treatment of Toxic Effects.**—Notwithstanding the very formidable symptoms produced by large doses, fatal effects are rare. An ounce of the tincture has been swallowed without producing death, probably because the prompt emesis which was excited caused the rejection of the most of it. Ordinarily the symptoms are rapidly relieved by the suspension of the remedy and the administration of opium and stimulants. The head should be kept low and the application of external heat is of assistance in the treatment.

**Therapy.**—The form and mode of administration is of some importance. The fluid extract is a saturated tincture, and resembles, in this respect, Norwood's. The tincture is preferred by Bartholow in doses of about 5 drops, not at a longer interval than two hours. The recumbent posture must be strictly enforced, in order to avoid the emetic effects, which are so depressing that the remedy is never used for this purpose. In various forms of overaction of the heart, hypertrophy, irritable heart, and abnormal tension of Bright's disease, it is of great service. It should not be used where there are valvular lesions and the cardiac muscle is enfeebled, or where there is dilated or fatty heart. In aneurism, in conjunction with the proper regimen and rest in bed, veratrum viride favors coagulation of the blood and diminishes the pressure, the effects being carefully watched so as to avoid vomiting. In exophthalmic goitre or Basedow's disease, Germain Sée, Guyat, Huchard, and others have had successful results from the use of 20 to 25 drops daily of the tincture.* In the first stage of pneumonia and acute congestions of the viscera, there is an accumulation of favorable testimony; it directly reduces the tendency to accumulation of blood, and diminishes the danger of exudation. In pneumonia, when taken at the very beginning, and doses of ♏x–xv of the tincture given every two hours or less, until there is a reduction in the pulse-rate and temperature, veratrum will produce the best results; it is useless after fibrinous deposit has taken place. Green veratrum has been employed as an antipyretic in acute rheumatism. In active hæmorrhage or acute mania, in the plethoric, this remedy also moderates the force of the circulation, and may at once check the seizure. In typhoid fever it is inadmissible, except in cases of hyperpyrexia with active delirium. In puerperal convulsions it has been given in doses of half a drachm of the fluid extract every fifteen minutes until vomiting is produced, or the convulsions cease. Veratrum viride, in small doses, often rapidly relieves or cures tonsillitis, especially when combined with morphine:

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* Annual of the Universal Medical Sciences, 1890, vol. v, p. A-137.

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| ℞ Tinct. veratri viridis, | ♏xvj vel xxxij. |
| Morphinæ sulphatis, | gr. j. |
| Aquæ menth. pip., | f℥ij. |

M. Sig.: A teaspoonful every hour or two, until relieved.

Phillips reports that this remedy seemed to relieve a case of persistent priapism after antimony, belladonna, and bromides had failed. It is thought that veratrum viride is of value in preventing or diminishing the severity of inflammation after abdominal injuries.

### VERBASCUM.—Mullein.

**Pharmacology.**—Verbascum thapsus (N. O. Scrophularineæ), or mullein-plant, grows by the roadside and in neglected fields. Its leaves are large and woolly, and it bears yellow flowers in dense spikes. The leaves contain a large proportion of mucilage, and a small quantity of volatile oil exists in the flowers.

**Physiological Action and Therapy.**—Mullein is demulcent, expectorant, and contributes to nutrition. It has long enjoyed a popular repute in Ireland as a remedy in pulmonary affections. Quinlan esteems it of considerable value in phthisis and other wasting diseases. He states that this plant relieves cough, diminishes expectoration, and increases the bodily weight. It is given in the form of an infusion made with milk, 4 ounces of the fresh, or a corresponding quantity of the dry, leaves being boiled for ten minutes in a pint of fresh milk. This quantity is to be drunk thrice daily, while still warm. Though the milk doubtless adds to the effect, Quinlan saw benefit result from administration of the juice alone. The taste is unpalatable and is disguised by the milk. It may also be of service in bronchitis and asthma. Mullein has likewise been used in diarrhœa, irritable bladder, and cystitis. The flowers are said to remove warts. They are applied, freshly taken from the calyx, by pressing and rubbing upon the growth. In aphonia dependent upon laryngeal irritation dried mullein-leaves have been smoked with alleged advantage. Mullein has been employed as an enema in dysentery and as a poultice for hæmorrhoids.

### VIBURNUM OPULUS (U. S. P.).—Viburnum Opulus, Cramp Bark.

### VIBURNUM PRUNIFOLIUM (U. S. P.).—Black Haw.

*Preparations.*

*Extractum Viburni Opuli Fluidum* (U. S. P.).—Fluid Extract of Viburnum Opulus. *Dose*, f℥j–ij.

*Extractum Viburni Prunifolii Fluidum.*—Fluid Extract of Viburnum Prunifolium. *Dose*, ♏xv–fʒj.

*Pulvis Extracti Viburni.*—Powdered Extract of Viburnum. *Dose*, gr. iii–x.

*Extractum Viburni.*—Extract of Viburnum. *Dose*, gr. iii–x.*

**Pharmacology.**—Viburnum prunifolium (Caprifoliaceæ), or black haw, is a tree which is common in the United States east of the Mississippi. Its height varies from 10 to 30 feet. It is generally found upon rocky hill-sides, in rich soil. Its trunk rarely exceeds 6 inches in diameter. The wood is heavy, hard, and brittle, reddish-brown in color. The bark of the root is the portion employed. The chemical constituents of the bark are **Viburnic acid,** identical with valerianic acid; **Viburnin,** a bitter, resinous body, and also sugar and tannic, oxalic, citric, and malic acids.

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* Under the name of Liquor Sedans, Parke, Davis & Co. have offered a substitute for certain copyrighted preparations. Each fluidounce contains 60 grains each of black haw and golden seal, 30 grains of Jamaica dogwood, combined with aromatics, q. s., making an elixir, or compound extract, of viburnum. *Dose*, fʒij.

**Physiological Action.**—It sometimes causes nausea and vomiting, but when retained it is a tonic, astringent, antispasmodic, and nerve-sedative. According to the experiments of Dr. R. L. Payne, Jr., of Lexington, N. C., upon cold- and warm-blooded animals black haw seems to be without influence on sensibility or consciousness, but has a decided effect upon the centres of motion, producing paresis, followed by paralysis and, finally, loss of all reflex power. Viburnum depresses the heart's action and full doses cause diminution of blood-pressure, partly on account of cardiac weakness and in part from a distinct action on the vaso-motor system. Fatal doses occasion paralysis of the heart prior to the cessation of respiration, the heart being arrested in diastole.

**Therapy.**—The attention of the medical profession was drawn to viburnum by Dr. Phares, of Mississippi, in 1866. This writer described it as "nervine, antispasmodic, tonic, astringent, and diuretic," and of particular value in the prevention of abortion, whether habitual or otherwise, whether threatened from accidental cause or criminal drugging. An abundance of testimony on both sides of the Atlantic has accumulated to confirm this statement as to its value in threatened abortion. Given before the membranes have been detached, it rarely fails to quiet uterine action, provided the fœtus be living. It is stated that this remedy produces good results in cases where there is a habitual tendency to abortion. A number of such cases have been treated with viburnum by Jenks, Chenes Revill and others with the most satisfactory results. Black haw affords relief to the after-pains and the so-called "false pains." It has been found of value in the treatment of dysmenorrhœa, especially when associated with profuse flow, and in the absence of serious mechanical obstruction. Even in the latter case, however, it is often able to diminish the pain. In spasmodic dysmenorrhœa it is thought to be more efficient when combined with Jamaica dogwood. Dr. Allan S. Payne obtained very good results from viburnum in severe cases of membranous dysmenorrhœa. In amenorrhœa dependent upon anæmia it is likewise of service. In menorrhagia and metrorrhagia due to systemic causes, as malaria, anæmia, disease of heart or liver, this remedy has proved particularly valuable. The uterine hæmorrhages which attend the menopause, as well as the various vaso-motor and nervous disorders so frequent at that period, are materially relieved by viburnum. Dr. R. D. Style, of Richmond, Va., in charge of the small-pox hospital of that city, remarks that the occurrence of the catamenial epoch during an attack of small-pox is frequently a serious and troublesome complication, but that the use of viburnum in such cases obviates the necessity of a resort to mechanical methods of checking hæmorrhage. The vomiting of pregnancy has occasionally been relieved by this remedy, and its use has sometimes been attended with success in sterility of the female. For its astringent effects viburnum has been given in diarrhœa and dysentery. Dr. R. L. Payne, Jr., has seen marked reduction of the tremor of paralysis agitans caused by the administration of viburnum. He suggests that its antispasmodic virtues should render it useful in the convulsions of hysteria and hystero-epilepsy, and in petit mal. Locally, the diluted fluid extract has been used as a gargle in aphthous sore mouth and as a lotion to indolent ulcers.

Viburnin, which appears to be the active principle of black haw, has been given in doses varying from ¾ grain to 2¼ grains.

The **Viburnum opulus,** or cramp-bark, belongs to the same natural order as the preceding. It is used only in the form of fluid extract, and is given to prevent or relax cramps of all kinds resulting from hysteria, dysmenorrhœa, or pregnancy.

## VIOLA TRICOLOR.—Heart's Ease, or Pansy.

### *Preparation.*

*Extractum Violæ Fluidum.*—Fluid Extract of Viola Tricolor. *Dose,* f℥ss–ij.

**Pharmacology.**—Viola tricolor (Violaceæ), heart's ease, or pansy, is a native of continental Europe and cultivated in the United States. Its medicinal virtue resides in the leaves of the wild plant. Mandelin has discovered that the plant contains salicylic acid. It likewise possesses a small quantity of an emetico-cathartic principle, **Violin**; also existing in Viola odora, or sweet violet. The syrup of viola, made from violets, is a pale-violet colored, agreeable vehicle for medicines for æsthetic patients.

**Physiological Action and Therapy.**—The little that has been recorded concerning the physiological action of viola betrays a certain resemblance to the effects of salicylic acid. Viola is said to produce a sense of confusion and dullness in the head, with headache; some dimness of vision; salivation; vesical tenesmus, with frequent and profuse micturition; turbid urine, offensive to the smell; a sense of heat over the whole body; sweats, itching, and nettle-rash. The first publication upon the action of this drug seems to have been by Schrack, in 1779, who recommended it as a specific remedy in crusta lactea, or infantile eczema of the head and face. In Germany, it gradually fell into disuse, but is still employed in France, and the advocacy of Professor Hardy induced Dr. H. G. Piffard, of New York, to make use of viola in eczema. It is used as an internal medicine. An infusion in milk of the fresh herb, deprived of root and flowers, was long employed. Hardy advised a combination with senna. Piffard now makes use of the fluid extract, and speaks favorably of its results. It is most successful in the second stage, with serous or sero-purulent exudation and crusting. Full doses, given in acute eczema, cause aggravation and extension of the eruption, with increased local heat and itching. These effects continue several days. In order to avoid them, Piffard advises that but from 1 to 5 drops should, in beginning, be given to a young child, once or twice a day. If no improvement occur, the dose may be increased; if aggravation result, the drug should be discontinued for a few days, and then resumed in smaller quantity. A larger commencing dose (from 10 to 15 drops) is required in subacute or chronic eczema. In adults, ½ drachm to 2 drachms may be given as the beginning dose in subacute cases. It should be taken in a small quantity of water, on a empty stomach, and, if possible, about half an hour before meals.

**VISCUM.—Mistletoe.**

**Dose,** gr. x–ʒj, in decoction, fluid extract, or tincture.

**Pharmacology.**—The mistletoe was formerly known botanically as Viscum, but is now called Phoradendron (N. O. Loranthaceæ); the European variety is P. album, the American P. flavescens. They are parasitic plants, the latter growing on oaks, elms, etc. The plant contains mucilage, fixed oil, resin, starch, etc., and **Viscin** ("bird-lime" or "bird-glue"), a viscous, glutinous substance; also found in other plants.

**Physiological Action.**—Mistletoe is a valuable oxytocic and nerve-sedative. It is a cardiac tonic resembling digitalis in its action upon the cardiac muscle. The berries cause emesis and catharsis, with prostration, bloody stools, and convulsions in children who have eaten them.

**Therapy.**—In epilepsy, chorea, asthma, and many other nervous affections, mistletoe deserves further trial. In weak heart, with insufficient contractile force, it has some value; in uterine hæmorrhage it has been found useful. Viscum has likewise been employed in dropsy and amenorrhœa. It is of service in menorrhagia, and has been used during labor to excite uterine contractions. The use of mistletoe during labor has been earnestly advocated by Dr. W. H. Long, of the United States Marine-Hospital Service, upon the ground of its rapidity of action and its ability to excite intermittent contractions.

**VITELLUS** (U. S. P.).—**Yelk of Egg.**

*Preparation.*

*Glyceritum Vitelli* (U. S. P.).—Glycerite of Egg-Yelk (fresh egg-yelk 45, glycerin 55 parts). External use.

**Pharmacology.**—Vitellus is the yelk of the egg of the domestic fowl Gallus bankiva (var. Domestica; class, Aves; order, Gallinæ). It contains **Vitellin,** resembling casein, **Lecithin**, a phosphorized fat, with albumin, a yellow and fixed oil, cholesterin, salts, sugar, etc.

**Physiological Action.**—Egg-yelk is a bland, oily substance, very useful in making emulsions. It is highly nourishing, and, as it contains phosphorus, it is especially restorative to the nervous system. The glycerite is a good vehicle for codliver-oil, for children.

**Therapy.**—Vitellus is beneficial in consumption and wasting diseases, as a special food for the nervous structures, and it can be given in conjunction with codliver-oil, or as a substitute for it. The glycerite is a good application to sore nipples, chapped lips and hands. It is a good protective in erysipelas and other acute skin affections.

**XANTHIUM.—Clotbur.**

**Pharmacology.**—The whole plant of Xanthium strumarium (Compositæ), growing widely in Europe and America, possesses medicinal virtue. A fluid extract is given in the dose of 1 to 2 fluidrachms.

**Therapy.**—Xanthium, according to Dr. John W. Eckfeldt, is a decided alterative and hæmostatic, and is useful in various forms of hæmorrhage. In metrorrhagia, post-partum bleeding, and hæmorrhages occurring during the climacteric period this remedy is of value. Clotbur is serviceable, likewise, in bleeding piles and in dysentery. In strumous enlargement of lymphatic glands and in skin diseases of a scaly form it is reported to be beneficial.

### XANTHOXYLUM (U. S. P.).—Prickly Ash.

**Dose,** gr. x–xxx.

*Preparation.*

*Extractum Xanthoxyli Fluidum* (U. S. P.).—Fluid Extract of Xanthoxylum. *Dose,* fʒ ss–j.

**Pharmacology.**—The bark of Xanthoxylum Americanum and of Xanthoxylum Clava-Herculis (Rutaceæ) contains a bitter principle, **Xanthoxyline,** which is an alkaloid, probably, identical with **berberine.** It also contains a volatile oil, resin, gum, a fixed oil, etc.

**Physiological Action.**—Prickly-ash bark is an aromatic bitter ; it is also diaphoretic, diuretic, and sialogogue. It causes augmented secretions along the intestinal tract, including the liver, and has emmenagogue properties. It is also considered alterative. Xanthoxyline increases the action of the heart and raises arterial tension.

**Therapy.**—Xanthoxylum is used in a variety of disorders, from toothache to jaundice. It is an ingredient in the compound syrup of clover (see Trifolium), which is used in the treatment of syphilis and scrofula ; also in chronic and muscular rheumatism and skin disorders. Prickly ash is a very effective tonic to the mucous membrane of the gastro-intestinal canal. It assists glandular action and can be employed for the treatment of many diseases in which the glands of the skin or mucous membranes are affected. The following combination will be serviceable :—

| | |
|---|---|
| R Tinct. xanthoxyli, . . . . . . . . . . . | f℥iv. |
| Tinct. nucis vomicæ, . . . . . . . . . . | ♏cc. |
| Tinct. cardamomi, . . . . . . . . . q. s. ad | f℥v. |

M. Sig. : Two teaspoonfuls in water three times a day. A suitable tonic, useful in atonic dyspepsia, acne, and seborrhœa.

In functual dysmenorrhœa, or suppression of the menses, prickly ash is successful, in doses of 30 minims of the fluid extract, which is a strong tincture. In pharyngitis and post-nasal catarrh, a decoction may be used as a wash or gargle, and the fluid extract administered internally. In liver disorders, combined with cascara and other drugs, it is often very decided in its effects.

**Xanthoxyli fructus,** or prickly-ash berries, contain volatile oil and a resin, and are antiseptic. They are used in fluid extract or decoction, in affections of mucous membranes, especially diarrhœa, cholera morbus flatulence, colic, etc. The fluid extract is alcoholic, and doubtless the menstruum aids in the effect. Prickly ash is useful in constipation due to deficiency of the intestinal secretions.

### ZEA MAYDIS OLEUM.—Oil of Zea Mays.

**Pharmacology.**—The stigmata of Zea Mays, and the fungus or Ustilago, have already been considered. The fruit or seed, commonly known in this country as corn, contains a considerable quantity of a bland, yellow, fixed oil, which adds to its value as food and might be utilized in pharmacy in making ointment.*

## **ZINCUM** (U. S. P.).—**Zinc.**

### *Salts and Preparations.*

*Zinci Oxidum* (U. S. P.).—Zinc Oxide. *Dose*, gr. ¼–v.
*Zinci Bromidum* (U. S. P.).—Zinc Bromide. *Dose*, gr. i–v.
*Zinci Chloridum* (U. S. P.).—Zinc Chloride. For external use.
*Zinci Acetas* (U. S. P.).—Zinc Acetate. *Dose*, gr. ss–ij, or as an emetic, gr. x–xxx.
*Zinci Carbonas Precipitatus* (U. S. P.).—Precipitated Zinc Carbonate. *Dose*, gr. ii–iij.
*Zinci Iodidum* (U. S. P.).—Zinc Iodide. *Dose*, gr. ss–ij.
*Zinci Phosphidum* (U. S. P.).—Zinc Phosphide. *Dose*, gr. $\frac{1}{20}$–¼.
*Zinci Sulphas* (U. S. P.).—Zinc Sulphate. *Dose*, gr. i–xx.
*Zinci Valerianas* (U. S. P.).—Zinc Valerianate. *Dose*, gr. i–ij.
*Zinci Lactas.*—Zinc Lactate. *Dose*, gr ss–j.
*Unguentum Zinci Oxidi* (U. S. P.).—Ointment of Zinc Oxide (20 per cent.).
*Liquor Zinci Chloridi* (U. S. P.).—Solution of Zinc Chloride (50 per cent.).
*Zinci Sulpho-Carbolas.*—Zinc Sulpho-Carbolate. *Dose*, gr. ii–iij.
*Zinci Cyanidum.*—Zinc Cyanide. *Dose*, gr. ¼–iss.
*Oleatum Zinci.*—Oleate of Zinc (5 per cent.).
*Unguentum Zinci Carbonatis.*—Ointment of Zinc Carbonate (20 per cent.).
*Unguentum Zinci Carbonatis Impurum.*—Calamine Ointment (made with native carbonate of zinc).

**Pharmacology.**—Zincum is metallic zinc, in the form of sheets or of irregular, granulated pieces. It is a silvery metal when polished, but soon tarnishes, and, when exposed to the air, forms oxide or carbonate. The zinc salts are white, and are usually soluble in water, but the oxide, carbonate, phosphide, and cyanide are insoluble. The soluble salts are usually poisonous, and zinc cannot be used for cooking utensils on this account.

**Physiological Action.**—Most of the salts of zinc are astringents, but some are corrosive poisons; among the latter are the chloride, acetate, sulphate, iodide, and cyanide. They produce pain, nausea, vomiting with great retching, and sometimes catharsis and muscular depression. Toxic doses of zinc oxide, experimentally administered to animals by D'Amore and Falgone, gave rise to vomiting, hæmaglobinuria, albuminuria and glycosuria.

Continued use of zinc salts causes symptoms of disorder of the nerve-centres resembling those of lead poisoning, showing less tendency to accumulate in the system than some other metals; but elimination, as in other cases, takes place through the action of the liver and intestinal glands. In cases of poisoning, the object of treatment would be to favor evacuation and to relieve symptoms. It is best to give flour and water, or milk, or soapy water; the alkaline bicarbonates, especially soda, are the chemical antidotes. The hypodermic injection of morphine may be required to relieve vomiting. Subsequently, the use of potassium iodide warm baths, and laxatives will remove the metal compounds from the tissues.

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* An interesting article on "Oil of Indian Corn," by Dr. Charles O. Curtman, appeared in the *Drugman*, July 25, 1886.

**Therapy.**—In weak solutions, the zinc salts may be employed as astringents. The acetate (gr. ss–j) in rose-water (f℥j) is useful as a collyrium in conjunctivitis; it is beneficial, also, as an injection in gonorrhœa and gleet:—

| | | |
|---|---|---|
| ℞ Zinci sulph., | | gr. v. |
| Bismuth. subnit., | | ʒiss. |
| Glycerini, | | f℥ss. |
| Aquæ cinnamomi, | q. s. ad | f℥v. |

M. For injection in gonorrhæa after the acute stage has passed.

| | | |
|---|---|---|
| ℞ Zinci sulph., | | gr. vj. |
| Tinct. opii deod., | | |
| Tinct. catechu, | āā | f℥ss. |
| Aquæ rosæ, | | f℥ij. |

M. Sig.: For injection in chronic gonorrhœa or gleet.

Injections of zinc permanganate were highly esteemed by the late Mr. Berkeley Hill in acute gonorrhœa. He generally made use of a solution containing 1 grain of the salt to half a pint of distilled water. The salt should always be employed alone and in distilled water.

The sulphate is likewise used as a collyrium (gr. ii–iv to ℥j), especially when conjunctivitis tends to become chronic, and is beneficial in inflammations of the skin. In acne, Dr. Fred. J. Leviseur* uses in conjunction with hot-water applications:—

| | | |
|---|---|---|
| ℞ Zinci sulphatis, | | |
| Potassii sulphitis, | āā | ʒj |
| Aquæ rosæ, | | f℥iv. |

Dissolve each ingredient separately in 2 ounces of the rose-water, mix and add

| | | |
|---|---|---|
| Resorcini, | | ʒj. |

Sig.: Lotion; shake well. This is to be used hot at night and cold in the morning.

The ointment of zinc oxide is largely used as a protective and slightly astringent application to acute skin affections, and to an ounce or more can be added carbolic acid, ʒss; oil of cade, ʒj; tar, ʒss–j, and other agents, according to the case, for treatment of eczema, herpes, erysipelas, and burns. The zinc-glue recommended by Unna as forming a stiff surgical dressing consists of 10 parts of zinc oxide, 30 parts each of gelatin, glycerin and water. The preparation is rubbed into the gauze or muslin of the bandage. The chloride is a powerful caustic and antiseptic. In dilute solution (gr. i–ij to ℥viij), it is useful as an injection in gonorrhœa or leucorrhœa. It has been suggested that this salt may be rendered more efficient by mixing it with lanolin or some bland oil and allowing it to remain for a few minutes in the urethra. The following formula is proposed:—

| | | |
|---|---|---|
| ℞ Zinci chloridi, | | gr. vj. |
| Lanolin, | | ʒjss. |
| Aquæ, | | f℥iij. |
| Ol. olivæ, | q. s. ad | f℥vj. |

M.

In stronger solutions, or mixed into a paste with flour and water, zinc chloride can be applied to lupus or malignant growths, to be used for creating sloughs. In a case of recurrent luxation of the shoulder,

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* *Medical Record*, September 13, 1890.

Dubreuil overcame the tendency to dislocation by six hypodermic injections, performed every second or third day, of 2 drops of a 10-per-cent. solution of zinc chloride. The fluid was deposited in various portions of the anterior superior portion of the capsule below the acromion process.

Zinc chloride, in the form of a paste, made with starch, or 4 parts of zinc chloride, farina 3 parts, zinc oxide 1 part, as used by Vohwinkel, is often a very effective application to morbid growths. Haberlin (*Correspondenzblatt für Schweizer Aerzte*), in inoperable uterine carcinoma, employs a paste of zinc chloride, which he regards as a good palliative treatment. The elder Penrose, of Philadelphia, has likewise applied zinc chloride in the form of a saturated solution by means of a tampon in malignant disease of the uterus with decidedly good effect. This salt may also be employed for the purpose of destroying epitheliomata, nævi, enlarged glands, warts, and condylomata. The liquor is a strong preparation, and, greatly diluted (ʒj–Oj), it is a detergent and stimulating application to old ulcers, and has likewise been employed as a disinfectant for wounds.

Zinc iodide is only used in ointment for enlarged glands (ʒj–℥j) of simple ointment), or in solution as an application to enlarged tonsils. The oxide, when in a smooth, dry powder, is useful as a dusting-powder, for infants, but the carbonate is better for this purpose. Oleate of zinc has been already considered. W. D. Haslam states that a mixture of equal parts of iodoform and oleate of zinc is of great value in gynæcology, applied by insufflation or on a tampon.

Zinc subgallate has been recently recommended as an efficient antiseptic and desiccant dressing in the treatment of eczema, wounds, otorrhœa and hæmorrhoids. The compound is applied pure, or it may be diluted with inert powders or ointments. Suspended in water and mucilage in the proportion of 1 to 16 it constitutes a useful injection in gonorrhœa.

The application of solutions of zinc, especially of the chloride, is not without danger. It has been the practice of some gynæcologists to apply zinc chloride to the inner surface of the uterus in the treatment of metritis. Dr. Pozzi warns against its use in young women and in acute inflammation, on account of the risk of producing atresia and obliteration of the uterine cavity, or setting up tubal inflammation. Doleris * prefers curetting to the application of caustics, which also receives the sanction of Goodell. Aseptic curetting is commonly safe, and causes no such ill effects, even in complicated cases.

Injections of zinc chloride have been employed, with reported advantage, in order to promote union of fractured bones. About 15 minims of a 1 per cent. solution are injected into the neighborhood of the fracture. The same procedure has likewise been made use of in pulmonary tuberculosis. Dr. Jules Comby has resorted to this method in a number of cases and states that the results were favorable and that the treatment merits further trial. The strength of the solutions which he used varied from 1 in 50 to 1 in 20, and three drops were introduced every third or fourth day. All the cases thus managed were in an early stage and the disease was confined to the apices. The object of the treatment is to favor the formation of fibrous tissue and produce a cure in the same manner as occurs in the natural arrest of the disease. The same plan has been applied in cases of tuberculosis of joints and in lupus.

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* *Provincial Medical Journal*, December 1, 1890.

Zinc sulphate is a decided astringent, and in doses of gr. x–xx is a prompt emetic. It has been used for the latter purpose in narcotic poisoning, croup, and for promptly evacuating the stomach. It is a systemic emetic, and causes vomiting when injected into the blood. As an astringent, it has been administered in combination with opium or Dover's powder, in diarrhœa, and chronic dysentery. In small doses, it has been employed as an antispasmodic in asthma, chorea, epilepsy, angina pectoris, hysteria, etc. The stomach becomes remarkably tolerant of the sulphate, so that as much as 40 grains have been given, thrice daily, without exciting sickness of the stomach. Such massive doses, however, should not be long continued, as they eventually accasion superficial ulceration of the stomach. Zinc sulphate is also frequently employed internally for the relief of bronchorrhœa.

In the treatment of chorea zinc sulphate is used, beginning with 1-grain doses three times daily and gradually increasing them until the limit of tolerance is reached. A case has been recorded by Dr. J. Sidney Hunt, in which traumatic tetanus was successfully treated by a combination of opium and zinc sulphate. Zinc sulphocarbolate is an antiseptic and astringent. Dr. W. F. Waugh has used this salt for several years in cholera infantum and typhoid fever, and all cases in which the occurence of fetid stools, with tympanites, etc., indicates the need of intestinal antisepsis. In typhoid fever, he has treated upward of seventy cases, with no death in any case where this salt was employed from the beginning. The dose is gr. ss to gr. j for children, gr. iiss to gr. v for adults, to be given every two hours until the stools are odorless, and thereafter in doses sufficient to keep the stools in this condition. The effects are a reduction of the fever, tympanites, diarrhœa, and delirium; the attack is shortened and rendered less dangerous. When the symptoms of cholera infantum assume the dysenteric form, the zinc is given in enemas, 10 grains to 2 ounces of warm water. Zinc cyanide is used in Germany as a substitute for hydrocyanic acid, the dose is gr. ¼ gradually increased to gr. iss. given in a mixture. It has also been employed in epilepsy, chorea, and in neuralgia, in painful affections of the stomach, and dysmenorrhœa. Professor Lashkevich recommends the cyanide in the treatment of palpitation, want of rhythm and pain in the region of the heart.

In many nervous affections, zinc valerianate has special advantages over other salts in neuralgia, nervous headache, nervous cough, ovaralgia, chorea, epilepsy, etc.; if given in small doses, repeated at short intervals, it is beneficial. The night-sweating of phthisis is sometimes checked by zinc oxide, given in pill form (gr. iij at night); the oxide may also be given in the summer diarrhœa of infants or adults. In chorea the same salt is of much value alone, or combined as follows:—

| | |
|---|---|
| ℞ Zinci oxidi, | gr. v. |
| Ferri pyrophos., | gr. xl. |

M. et ft. pil. no. xx.
Sig.: Two or three pills a day.

Zinc oxide is serviceable in gastralgia, and has sometimes proved useful in epilepsy. Bartholow believes that it is most successful when epilepsy is the result of peripheral irritation, having its origin in the stomach. The same writer esteems the oxide as of prophylactic value in spasmodic asthma. Whooping-cough and chronic alcoholism have their symptoms relieved by the oxide, which has also been advantageously employed in chorea. The tremors and unsteadiness due to chronic alcoholism will sometimes yield to the influence of zinc oxide, and Guéneau de Mussy reported it as of value in subduing the tremor caused by mercurial and arsenical poisoning. Zinc lactate has been serviceably administered by von Graefe and others in rapidly developing cases of amblyopia, especially when of hysterical origin. Zinc cyanide has sometimes relieved the pains of articular rheumatism, but its use is apt to be followed by headache and it has been effectually superseded by more modern remedies. Zinc subgallate has been employed in doses of ½ to 4 grains with alleged good results in fermentative dyspepsia and night-sweats.

**ZINGIBER** (U. S. P.).—**Ginger.**
**Dose,** gr. x–xv.

*Preparations.*

*Extractum Zingiberis Fluidum* (U. S. P.).—Fluid Extract of Ginger. *Dose,* ♏i–xx.

*Oleoresina Zingiberis* (U. S. P.).—Oleoresin of Ginger. *Dose,* ♏ss–ij.

*Syrupus Zingiberis* (U. S. P.).—Syrup of Ginger. *Dose,* fʒi–iv.

*Tinctura Zingiberis* (U. S. P.).—Tincture of Ginger. *Dose,* ♏x–fʒj.

*Trochisci Zingiberis* (U. S. P.).—Troches of Ginger. *Dose,* one to three troches.

It also enters into aromatic powder, compound rhubarb-powder, and wine of aloes.

**Pharmacology.**—Ginger is the rhizome of Zingiber officinale (Scitamineæ), cultivated in tropical countries as a spice. Green ginger is put up in syrup or candied, and used as a digestive confection at the dinner-table as a corrective of flatulence. It comes from different sources, but the Jamaica ginger is preferred for culinary purposes, having the best flavor. Ginger contains a volatile oil, to which the flavor is due, and a pungent resin.

**Physiological Action.**—It is an agreeable carminative and stimulant, increasing the secretions and promoting peristalsis. It increases slightly the amount of urine, and acts as an irritant to the bladder and urethra. Externally it is rubefacient.

**Therapy.**—Ginger is added to purgative pills to prevent griping, and to salines in order to disguise their taste. It is useful in atonic dyspepsia, especially in elderly persons, and is of service in flatulence and diarrhœa. The syrup is commonly used as a vehicle for stomachic preparations and tonics.

# PART III.

## NON-PHARMACAL REMEDIES AND EXPEDIENTS EMPLOYED IN MEDICINE NOT CLASSED WITH DRUGS.

This portion of the work will be devoted to the discussion of certain agents and expedients employed in clinical therapeutics, which cannot be properly classed with drugs. Each will be considered under its own heading, with the following titles: Electrotherapy; Kinesitherapy, Massage and Rest-Cure; Pneumotherapy; Hydrotherapy and Balneology; Climatotherapy; Psychotherapy, Metallotherapy and Suggestion or Hypnotism; Diet in Disease; Mineral Springs; Effects of Heat and Cold, Light and Darkness, Music, etc., concluding with a brief review of various methods and expedients, chiefly mechanical and local in their effects. Although the latter find a limited place in practical medicine, they are, as a rule, surgical expedients, and are, therefore, in this place, less fully considered than they would be in a treatise specially devoted to that department.

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## ELECTRICITY IN MEDICINE—ELECTRO-THERAPEUTICS.

**Present Standing and Importance of Electro-Therapeutics.**—The scientific application of electricity to the human body for the treatment of disease has recently been greatly stimulated by its remarkable commercial development. Electrical science being essentially of modern origin, new principles and new economic applications being announced almost daily, it becomes absolutely necessary for a discussion of the employment of electricity in medicine to be introduced by a few words upon the present state of our knowledge of this department of physical science. A very brief consideration of the laws of electricity, with explanation of its terms and its technique, therefore, will precede a review of its therapeutic applications. It is unfortunate and embarrassing, to the medical student particularly, to find confronting him, at the very threshold of this subject, a mass of literature which has come down from a period when purely empirical methods prevailed and the nature of this force and its effects, both physiological and therapeutical, were very imperfectly understood. Not infrequently, even at the present day, medical writers betray a want of knowledge of its fundamental principles. There is less excuse for this now than ever before, because the ingenuity of electricians and expert instrument-manufacturers has been attracted in this direction and has brought to our aid apparatus of precision, both for therapeutics and for diagnosis, with which it is the duty of every physician to acquaint himself. Even if he does not propose to apply it to a great extent in his practice, he should do this much, at least, for his own protection, since he must at times rely upon some form of apparatus; and some of the electrical instruments which are offered for sale are of poor construction, entirely unfit for efficient medical use. Moreover, many bring discredit upon medical electricity by claiming to be specialists who are mere tyros, if not open charlatans, ignorant of the first principles of medical or of physical science. It is a comparatively easy matter for the well-trained physician to recognize and expose such pretenders, especially should they venture to boast of their results in public or before medical societies.

**The Foundation of Success in Electro-Therapeutics.**—The study of electro-therapeutics requires not only that we shall be versed in the laws and terms of electrical science, but also that we shall have good anatomical and physiological knowledge. It is, moreover, very evident that we must be familiar with pathology in its most comprehensive sense, in order to form a correct judgment, or prognosis, as regards the probable utility of electrical or any other treatment in a given condition, so that this valuable agent may not be brought into disrepute by being used in unsuitable cases. As it is important that such knowledge shall be acquired systematically, all reputed medical schools should teach thoroughly the principles of electricity and the construction of medical electrical apparatus and batteries, this course of study being made practical and attractive by abundant didactic and clinical instruction in this important branch of therapeutics. Since the best results can be obtained in this direction only by a due recognition of the importance of this branch in the curriculum, it is hoped that there soon will be established a chair of electro-therapeutics in every university and medical college in the country.

**Definition of Electricity.**—The laws underlying electrical manifestations have been discovered and formulated; but electricity itself is an unknown force, just like heat or light. We may define electrification as a **condition of matter when acted upon by a peculiar force known as electro-motive force.** This "electro-motive force" is a form of energy which is convertible into and is, therefore, said to be correlated with the other physical forces, in accordance with the well-known law of conservation of force demonstrated by Helmholtz. That is to say that, whereas light, heat, motion, chemical action (electrolysis), and magnetism result from electricity, so, by the law of the correlation of forces, light, heat, motion, chemical action, and magnetism may be transformed back again and be manifested as electricity.

**Principle Underlying Electrical Manifestations.**—It is upon this principle that all forms of apparatus for economical and medical applications of electricity are constructed. Atmospheric electricity, which Benjamin Franklin proved to be identical with friction-electricity, certainly exerts an important influence upon health; and instances have been recorded where an electrical shock (lightning-stroke) has been followed by important physiological changes (*i. e.*, relief from paralysis, etc.); but no attempt at systematic therapeutic application has, as yet, been made with electricity from this source directly. The usual sources are chemical action, heat, magnetism, and motion (friction).

**The Electrical Current; its Physical Characters and Properties.**—

Although electricity is simply a condition of matter, or a "mode of motion,"—a "peculiar vibration or tension of the molecules of a body said to be electrified,"—it is convenient to speak of it as if substantial and, in fact, as matter in a fluid state. In some respects it appears to be analogous to water when the latter is acted upon by the force of gravity and atmospheric pressure; and authors have fallen into the habit, for convenience of description, of speaking of it as "the electric fluid," "the electric current"; also of the direction in which the current "flows"; its "pressure"; the "resistance" it encounters from poor "conductors"; the "waste of the current"; a "continuous" or "interrupted" current, and so on, the simile being heightened by comparing the dynamo, or source of the current, with a steam force-pump. It must be constantly kept in mind, however, that this is figurative language, adopted simply for convenience. It should not be inferred, for instance, when the human body is in circuit, that anything material flows through the body; the correct view is that the parts between the poles are more or less affected by a peculiar form of molecular activity which takes place in the tissues, and during this period the parts are in a characteristic condition, which will be referred to later on. This change may be simply physiological, and not inconsistent with restoration to a healthy condition; or it may be pathological, and produce permanent lesions. If the current be sufficiently powerful, decomposition will be produced (electrolysis), or the parts adjacent to the poles may be carbonized or blistered by the development of heat produced by resistance to the current (galvanic cauterization, or electrocausis). It is within the limits of physiological action, where no immediate and demonstrable change is ordinarily produced, that electro-therapeutics enjoys its widest field of medical application. Thus, in the treatment of neuralgia, muscular or nerve paralysis, the induction of artificial respiration, counter-irritation, etc., electricity finds constant employment in clinical medicine. Currents of greater strength are used in the electrolysis of morbid growths, removal of hypertrophied scars, destruction of hair, electrolysis of stricture of the urethra, etc. Under the method of Apostoli, currents of great strength are used in reducing uterine fibroids, checking hæmorrhage, etc. The destructive effects of the galvano-cautery are used in removing hypertrophies from the nose and for similar small operations, for which it is especially adapted.

**Correlation of Electrical and Other Forms of Force.**—Electricity cannot be said to have a separate existence of its own, electrification being simply a state or condition of matter depending upon the exercise of a force which produces certain physical, chemical, and physiological effects. The laws governing electrical action have been formulated, so that it may now be applied to medical and other economic purposes with precision and absolute control. Progress in every department of science depends upon the accuracy of measurement, which affords an opportunity for exact comparison and record. Electricity is no exception to this, although, owing to its nature, it presents peculiar difficulties not met with in other departments.

Electrical force is exceedingly rapid, and is easily converted into other forms of energy; so that it almost defies ordinary methods of measuring, such as are used in estimating velocity, weight, or heat. With the best conductors, its passage between distant points is nearly instantaneous.

**Electrification and Electro-Magnetism.**—As already stated above, electrification is the property or peculiar state which matter may assume under special conditions. Certain bodies, while in this state, exhibit peculiar and characteristic phenomena. For instance, when two dissimilar metals capable of being electrified are partly immersed in a liquid capable of permitting the passage of the current and of acting chemically upon one of them (*i. e.*, an electrolyte), if the free portions (or part outside the fluid) of the two metals are brought in contact or connected by a metallic conductor, such as a piece of copper wire, certain results may be observed to occur. One metal is slowly acted upon by the fluid; the other is not; but bubbles of hydrogen appear upon its surface. Under such circumstances the junction of the two metals will be found to possess electrical properties. Usually, for convenience, the metals are joined by a conjunctive wire, which must also be capable of becoming electrified and of acting as a conductor (or rheophore). When in this condition, in relation to the two metals just mentioned, the wire will attract iron filings; or, if brought over a compass parallel with the needle, or a bar magnet suspended by its centre, it will cause deflection of the magnetic needle, which, if the current be strong enough, tends to assume a position at right angles to the wire, deviating more or less from the magnetic pole and the so-called cardinal points of the compass. If a coil of wire be suspended so as to be free to move in all directions, it will, under the influence of an electrical current passing through from one end of the wire to the other, assume a north and south polar position, in the line of the magnetic meridian of the earth. Such a coil, while electrified, therefore, has assumed the properties of a magnet; it also attracts small pieces of iron, and may be used to convert a mass of steel or hard iron into a permanent magnet. If into the centre of a long coil, or spool, of insulated wire some **soft** iron (which does not become permanently magnetized) be inserted, we have a temporary **electro-magnet** formed, which only exhibits the properties of a magnet when the current is passing in the coil. This principle is of great utility, and appears in the interrupting mechanism of Faradic batteries, telegraph-sounders, telephone-receivers, electric-light generators (dynamos), and numerous other forms of apparatus.

**Intimate Relationship of Electricity and Magnetism.**—There are many points of similarity between electricity and magnetism, and the most plausible explanation of the latter is that the magnet is in a molecular state, which gives rise to permanent electrical currents connecting the poles. In the same way the conjunctive wire, during the passage of the electrical current, is in a condition in which it influences the magnetic condition of other objects near it, just as if it were surrounded by **lines of force** in a series of concentric rings. This may be illustrated, if not demonstrated, by placing some iron filings upon a plate of glass or a card and applying a strong magnet beneath, or by running a wire carrying a current perpendicularly through its centre. The iron filings will, under the influence of electricity, arrange themselves in concentric circles, exhibiting the directions of the lines of force, just as they do around the poles of the magnet.

**Lines of Force.**—These lines of force in the case of the magnet, flow in the air from the north to the south pole and back again through the iron, thus making a permanent closed circuit. In the case of the wire the concentric lines or whirls of force encircle the electrified conjunctive wire, so that when consecutive loops are arranged in the form of a helix or coil, the lines of force become parallel with the long axis, and the coil now exhibits magnetic properties. The space in which these phenomena are noted is considered the magnetic field, or area of induction. By reversing the experiment and passing a permanent magnet into a coil of wire, a current of electricity is temporarily set up, which is manifested at the extremities of the wire. This is the principle upon which magneto-electric machines are made or electric-light dynamos constructed. Coils or spools containing insulated bundles of soft-iron wire may be placed upon a frame and made to revolve rapidly within the magnetic field around the poles of a large magnet. When this is done electrical currents are set up, which are momentary; but, when a high speed is attained, they become practically continuous. By an ingenious arrangement in wrapping the wires, the currents set up on entering the field and upon leaving it, which are in different directions, are "commutated," or switched, so that they are made to re-inforce each other, and thus make a single current of definite direction and practically continuous.

**Properties and Effects of the Current.**—The effects of electricity are (1) physical or chemical, (2) physiological, (3) therapeutical. The methods of generating electricity are (1) physical (friction-electricity, thermo-electricity, dynamo-electricity, etc.), (2) chemical (galvanism), and (3) physiological (as shown by certain fishes,—torpedo,—and the human body to a less marked degree). Electricity is the same force under all circumstances; but each form of current possesses certain qualities, which depend upon the method of its generation. The principal qualities of an electric current are constancy, pressure, and volume. Assuming that a current under consideration is constant, or practically so, we have only to keep in mind the two latter,—pressure and volume,—and when these are well understood the difficulties of comprehension of electrical phenomena, about which so much has been written, almost entirely disappear. Returning to the analogy already named, of a pump forcing water through a pipe, we may regard every device for originating a current of electricity as a pump of more or less power. To complete the analogy, the discharge-pipe should be long enough to go around the circuit and terminate in the suction-pipe, so that the pump being set in motion and the apparatus filled with water, the current of water will be continuous. The force which starts the water is heat converted into motion; that which starts electricity is electro-motive force acting under a certain amount of tension or pressure, which will be shown hereafter to be due to difference of potential. If the power is withdrawn the circulation will cease, because of the obstruction (friction, inertia) which the water has to overcome. In hydraulics the force required to perform the work, with the resistance, is the subject of calculation, and the size and character of the engine are regulated according to the work to be done. In electricity the amount of electro-motive force or power of the apparatus is measured by volts instead of foot-pounds, and the resistance or friction is calculated according to a standard unit of resistance, known as the **ohm**. Just as, in the case of water, with a certain amount of pressure against a given amount of resistance, a definite number of gallons per minute will flow along the conductor, so, in electrical terms, we have a definite volume or strength of current, resulting from a certain amount of voltage against a given number of ohms of resistance. It is easily seen that a powerful pump would be at a great disadvantage in trying to force water through a half-inch pipe, and this difficulty is increased should the pipe be long. In order to get satisfactory results the pipe must be sufficiently large to carry off the water with facility and not offer too much resistance by friction. Therefore large pipes are better conductors than small, and short better than long ones. This is also true in electricity, and the rule is that **the conducting power** (other things being equal) **of a conductor is directly in proportion to the area of the cross-section, and inversely to the length.**

**Electro-Motive Force—Difference of Potential.**—To return, now, to the first illustration of two dissimilar metals in the electrolyte, we find that the current starts simultaneously with the joining of the metals (either directly or by means of a conjunctive wire), which "closes the circuit" and makes a current possible. The force which starts the current is called the electro-motive force; it is always the same for the identical combination of metals, and is independent of the size of the plates. The hypothesis with regard to the origin of the electro-motive force is, that it is due to a difference of potential of the two plates, the current flowing from the higher potential to the lower, just as water will flow from the higher level to a lower in case two reservoirs are connected. The higher is known as the positive (+) and the lower potential is called the negative (—), and identical metals always have the same relation to each other, which only awaits favorable circumstances to manifest itself.

**Electrical Measurements: Volts, Ohms, and Ampères.**—The unit of measurement of electro-motive force, as already stated, is the **volt**, which is a little less than the electro-motive force of the zinc and copper combination in the Daniell cell (which is $1\frac{79}{1000}$ volts). The unit of measurement of resistance is called an **ohm**; it is represented by the resistance offered by a column of pure mercury, 106 centimetres long and 1 square millimetre in area of cross-section, at a temperature of 32° F. This is called the legal ohm, because it was adopted by the International Electrical Congress, which met in Paris in 1884; it is a little less than the British Association unit, which previously had been the standard,—in the proportion of 1 to 1.0122. The resistance referred to is mainly that encountered by the lines of force in passing through the surrounding media; the tissues composing the human body, for instance, offer considable resistance to the passage of the current, depending, of course, upon how far the current is required to pass through the tissues, upon the size of the electrodes, and other circumstances.

The volt, or unit of electro-motive force, is sufficient to overcome a total resistance equivalent to one ohm and supply a volume of current equal to one ampère. The **ampère**, therefore, is the amount of current produced when one volt of pressure is opposed by one ohm of resistance; it is the unit of measurement of current strength. It is directly proportional to and may be measured by the amount of chemical decomposition (electrolysis) produced by the current in a unit of time. Thus, the current that will deposit 0.00111815 gramme (or 0.017253 grain) of silver upon a silver plate immersed in a standard solution of silver nitrate in a second of time has the strength of 1 ampère. This amount of electricity being more than is ever required for medical purposes, the unit is divided, for convenience, into thousandths, or milliampères. Any number of ampères can be sent through a conductor, provided the generator has sufficient electro-motive force and the conductor itself can carry the current; if the resistance is too great the wire will be destroyed by being fused or carbonized. In other words, where the resistance becomes disproportional the electricity, according to the law of correlation of forces, is liable to become converted into heat and light.

**Ohm's Law.**—The number of ampères of current flowing through a conjunctive wire within a given time depends upon both the electro-motive force or pressure and the resistance. This is expressed mathematically as follows:—

$$\text{Intensity of current strength} = \frac{\text{Pressure, or electro motive force (volts),}}{\text{Resistance, external and internal (ohms),}}$$

or $C\,S = \frac{E}{R}$. In other words, the strength of any current is **directly** as the voltage and **inversely** as the total resistance. The above is known as Ohm's law, which has constant practical applications, as will be demonstrated in the pages that follow.

**Passage of the Current—Rheophores, Electrodes, Anode and Cathode Poles.**—To confine ourselves for the present to the **galvanic cell,** we observe that the electrical impulse starts from the surface of the plate, which is chemically acted upon (generating or positive plate), and is conducted through the electrolyte to the negative or collecting plate, from whence it passes along the conjunctive wire in the opposite direction until the place of origin is reached. Should the conjunctive wire be divided in its course, the end connected with the collecting plate will be the **anode** or positive; the other extremity is the **cathode** or negative pole,—these names having reference to the course of the current, which is always from the anode to the cathode, or from the positive to the negative pole. In the closed circuit, therefore, the circuit is completed by the conjunctive wire above and by the intervening column of liquid below. As metals are usually better electrical conductors than liquids, it follows that the current encounters, under ordinary circumstances, the greater resistance inside of the cell (internal resistance), since the resistance offered by the conjunctive wire, which is a metallic connection usually (external resistance), is comparatively small.

**Practical Work of a Battery—Electrolysis.**—It may be laid down, as a rule, for any given battery that its efficiency will be at the maximum when the electro-motive force is sufficient for the work desired to be done and the external and internal resistances are balanced or equal. The external resistance arises partly from the nature of work to be done and partly from the resistance offered by the conductor, being increased according to its length and diminished according to its thickness. This also applies to the column of fluid between the plates. Therefore, we reduce the internal resistance if we bring the plates close together, and also increase their size so as to expose a larger surface in contact with the liquid, which, in effect, increases the thickness (cross-section) of the intervening column. The electro-motive force or pressure is increased by multiplying the number of cells until we obtain the required voltage for the work to be performed or resistance to be overcome. The **work** is a part of the external resistance, and both it and the required current strength are now matters of mathemathical calculation and measurement. Where the work does not require much current strength, as in heating the cautery, or electrolysis, the external resistance, therefore, not being very great, the battery may be balanced by increasing the size of the plates, using only a comparatively small number of cells. Where, on the contrary, the work requires great current strength, as where the human tissues are made part of the circuit, the plates should be of convenient, moderate size, but the electro-motive force must be increased by additional elements (more voltage), so that for ordinary medical work from 40 to 80 cells would be needed. It is evident, therefore, that the battery must be adapted to the work required of it; a galvano-cautery battery will not do for general medical purposes, nor can the ordinary small-celled medical battery be economically used for the cautery. The reason for this is obvious from the preceding explanation; any further attempt at a mathematical demonstration would only cause confusion. The larger cells cause more rapid decomposition of an electrolyte (or deposit a greater quantity of silver from the solution in the voltameter in a unit of time), or afford greater ampèrage of current with a good conductor than where small cells are used, because the larger cells have less internal resistance; and this is found to correspond with the results of experience.

In order to ascertain the number of ampères of current flowing through a circuit, divide the number of volts of electro-motive force by the number of ohms of resistence in the entire circuit. Thus, we have by Ohm's law:—

$$C \text{ (current strength in ampères)} = \frac{E \text{ (electro-motive force in volts)}}{R \text{ (total resistance, in ohms)}}$$

The electro-motive force of each cell, when acting and in good order, is fixed and is invariable for the same combination, without regard to the size of the elements. The entire electro-motive force (voltage) is the sum of that of the entire number of cells. The resistance, however, is variable, and depends upon many factors. As already stated, the work to be done is to be counted as part of the external resistance. To this must be added the resistance of the conjunctive wire and electrodes; also that within the cell, or the internal resistance. Thus, where there are a number of cells connected in series, the amount of the resistance of each cell must be multiplied by the total number of cells in order to obtain the total internal resistance.

It is impossible, without a thorough comprehension of Ohm's law, which lies at the foundation of electrical phenomena, to have any correct idea of the medical application of electricity. Once understood, everything becomes comparatively clear, and all forms of batteries or generators become simple and intelligible. If we have any two of the factors out of the three—$\left(C=\frac{E}{R}\right)$—we can ascertain the third one by a simple calculation. Having the electro-motive force (volts) and resistance (ohms), both external and internal, we can calculate the current strength (in ampères). Having the current strength and the voltage, we can determine the total loss, or resistance; or having the latter and the current strength, we can ascertain the voltage, or electro-motive force. We also have a means of directly ascertaining the current strength at any time by an instrument called a milliampèremeter, or the voltage by a voltameter.

**Electrical Dosage and Measurement.**—This is not the place to go into the details of apparatus, but we may anticipate a little, in order to explain how the current strength can be measured absolutely by the ampèremeter, milliampèremeter, or milliameter. The resistance of a galvanic cell, or the total resistance of a battery, may be determined by adding to the external resistance (by means of apparatus constructed for the purpose, containing graded **resistance coils**) until the current is reduced to one-half of its former strength, whence we learn that the added resistance just equals the original resistance, because the current strength is always inversely as the resistance. If the current is taken directly from the cell, and there is no external resistance, then the added resistance just equals the resistance inside of the cell or battery. The internal resistance of any form of cell may thus be measured by reducing the external resistance to a minimum, using a short and thick conjunctive wire of copper or silver, so that the external resistance may be ignored. After having measured the current strength and estimated the total resistance, the determination of the electro-motive force, or voltage, becomes a matter of simple calculation, since $E\ M\ F$ (voltage) $=C$ (in ampères) $\times\ R$ (in ohms).

In the foregoing reference to a combination of single cells to form what is called a "battery," it was stated that they are connected **in series**,—*i. e.*, the anode of one cell being attached to the cathode of the next,—the dissimilar plates or elements being thus connected together. If, on the contrary, we join all the poles of the same character,—*i. e.*, all the zincs and all the coppers, or carbons,—we have an arrangement known as a **parallel arc**, or they may be combined in sets, or **multiple arcs**, of five, ten, or any other desired number. The object of this arrangement is to reduce the internal resistance when the external resistance is small; but, as it also reduces the electro-motive force, it is not a useful arrangement, **except where the plates are too small** for the work required. With cells of the ordinary size this expedient is rarely resorted to at the present day.

**Sources of Electrical Energy Other than Galvanic.**—Thus far we have considered only the cell as a source of electricity, producing what is called the galvanic or battery current. Other forms of electricity will now be considered; these are induced or Faradic currents, friction or static currents, and magnetic or dynamic currents from all sources.

**Essential Identity of Electricity.**—It is of the highest importance to bear in mind that electricity from any source is the same force; it only differs in degrees of pressure (tension, electro-motor force), volume, and constancy. Returning for a moment to the analogy of water passing through pipes, we may have variations in **pressure** (differences of potential), or the force which enables the stream to overcome obstacles, as well as in **volume**, the latter depending principally upon the abundance of supply, the size of the pipe, and the material out of which it was constructed. Under precisely the same conditions of current strength, or pressure, and resistance, all the so-called different varieties of electricity will produce exactly the same effects. The current from the induction coil, which is intermittent and reversing (to-and-fro current), as has already been stated, can be commutated or made to flow in one direction, and the interruptions may be so rapid as to make the current practically continuous; it then becomes capable of producing the same effects—chemical and physiological—as are produced by the cell-current. Static electricity, properly directed and controlled, also will magnetize iron, heat a wire, or cause electrolysis. The current from a magneto-electric machine will cause contraction of muscular fibre, produce heat and light, or electrolysis, when the same relations of pressure and volume and resistance are observed as with the chemical or galvanic current.

**Induced Currents.**—The phenomenon of induction must here be considered before proceeding further. It has already been explained that an electrical current is accompanied by a disturbance of the molecules of the surrounding media, which occur in "whirls" or lines of force circulating around the conjunctive wire. This is shown by the influence upon the compass-needle, which assumes a position at right angles to the wire bearing the current. If a coil of copper or iron wire be substituted for the magnetic needle, electrical phenomena will be excited and temporary currents started up whenever the circuit of the primary wire is closed or broken. These are more powerful if the primary wire be itself rolled into a spool or coil and placed inside of the secondary or induction coil. It is necessary to have the primary wire covered with insulating material, so that adjacent turns do not come in immediate contact with each other, and, also, to have it comparatively thick, so as to carry a large volume of current. On the other hand, it is of advantage to have the secondary wire (also insulated) of fine wire, so as to bring as many turns or coils of it under the influence of the lines of force at any given time, as is convenient. As the electro-motive force (pressure, tension, or power of overcoming resistance) is **directly in proportion** with the number of coils of wire brought under the influence of lines of force (just as it is increased by the number of cells of the battery), it is evident that a fine wire in the secondary coil will yield a current of greater electro-motive force than a coarse wire. In this way the apparent paradox is explained of a galvanic current without sufficient strength to produce muscular contraction (because of the high resistance of the tissues), passing along a wire arranged in a particular manner, causing a current in a secondary coil of fine wire of sufficient electro-motive force or tension to produce active muscular contractions and painful sensations.

**Varieties of Quality in Faradic Currents.**—The electro-motive force, tension, and intensity or current strength of a faradic current from a properly-constructed apparatus depends principally upon (*a*) the strength of the current flowing through the primary coil at any given time; (*b*) the actual number of convolutions of wire exposed to the influence of lines of force in the secondary coil when in action; (*c*) the suitability to the work of the wire composing and connecting the extremities of the secondary coil, or the coil to which the electrodes are attached. It is seen, therefore, that much depends upon the secondary coil and the value of the connecting wire as a conductor. Many instruments are provided with connecting cords containing cheap, braided, brass wire, which is a poor conductor; well-insulated, flexible, copper wire is more suitable. Moreover, the secondary coil should have a large number of convolutions, and must, therefore, be made with fine wire; although, if too fine, it will impair its conducting power by introducing too much resistance. Finally, the flow of electricity through the primary wire should have sufficient volume for the work. Ordinarily, one cell of moderate size will be all that will be required.

**Mechanical Current Interrupter or Rheotome—Neef's Hammer.**—Since the currents in the secondary coil are only manifested at the times when the current in the primary wire is closed and opened, some device is needed to interrupt the current in the first wire. This may be done by any mechanical means, but the common method is that known as Neef's hammer. The principle upon which this is constructed is quite ingenious. Taking advantage of the fact that a current of electricity flowing along a wire arranged in a coil will cause soft-iron rods placed therein to become magnetic, although they immediately afterward lose their magnetism because soft iron cannot be permanently magnetized, we have the means of automatic interruption provided by the current itself. The construction of faradic or induction batteries is essentially such as is here described, with minor variations in details of the apparatus.

**Coarse and Fine Secondary Coils—Adams's Faradometer.**—It must be remembered that the ordinary rules governing electrical phenomena hold good with the induced current, and that, while we have increased electro-motive force by increasing the number of convolutions of wire **independently of the size of the wire,** the conducting power is inversely as the area of cross-section of the wire, and the current strength is correspondingly reduced by using the very fine wire, because it offers greater resistance. This is the explanation of the muddle which some writers appear to have fallen into with regard to the relative utility of the coarse and fine secondary wire coils of a faradic battery. When large electrodes are employed, and only a small portion of the body brought into circuit (as where individual muscles are to be acted upon), or, in other words, when the external resistance is low, the coarse wire is more effective, because it has less internal resistance and the current is better balanced. On the other hand, where a large part of the body is to be acted upon or the electric brush is to be used the external resistance is great, and better results are obtained from the fine coil—which has greater internal resistance, it is true, but also has more electro-motive force.

This is the gist of the whole matter, and requires no further explanation. Some of the confusion may be traced to the fact that, while we have instruments for measuring the galvanic or battery current (voltameter, milliampèremeter), we have not as yet had any form of apparatus adapted to measuring induced currents, with the exception of the faradometer of that accomplished electrician, Dr. Wellington Adams, which has been recently invented; but this has not yet been introduced, so far as we can learn, in medicine.

**Nature of Current from the Primary Coil.**—A note may be introduced here relative to the so-called primary current, or the current from the primary coil of a faradic apparatus. The momentary magnetism set up in the core of soft iron when the current is interrupted starts a temporary current in the primary wire. When the circuit is closed no current is manifested by the wire composing the primary coil, because it is short-circuited through its connection with the cell. On the contrary, where the circuit is open and the current is suddenly stopped, an electrical impulse is set up; and if these interruptions are quite rapid these impulses follow each other so closely as to constitute practically a current which, when proper connections are made, is found to be of small volume and strength, but all in one direction. The current derived from the secondary coil, on the contrary, is set up, both at the making and breaking of the circuit, in opposite directions, and cannot be said to have any direction under ordinary circumstances. At the same time, it must be stated that these currents are not equal in strength—that made on breaking the current being more powerful than that on closing the circuit; and if the external resistance be very great the weaker current is unable to pass, and the effects produced ultimately are those of a single current in one direction. As already stated, a commutator may also be employed, by which both currents can be made to flow in one direction, and thus be made to approximate in their properties those arising from galvanic or static sources.

**Static Electricity.**—The static or friction electrical machine is a familiar source of electrical phenomena; but within recent years great improvements have been introduced in the construction of these forms of apparatus which have made them useful and available for medical purposes. The principle upon which they are constructed is the old one of rubbing amber, or glass, with a non-conducting material, like silk. The ordinary form is that of a circular sheet or plate of glass, which is made to rapidly revolve in such a way that it is slightly rubbed with an exciting material, the glass and the rubber being insulated from each other and connected with the terminal posts, from which the current may be taken. To the further discussion of this current and its applications in medicine we will return later on.

**Electricity and Life-force.**—Electrical units of measurement—the volt and the ampère—bear a fixed value and relation to other units used in measuring force, light, heat, etc. From what has already been stated, it is clear that the proper way to regard electricity is simply as a form of energy, which may be converted at will into other forms. As Hippocrates wrote, "There is no sacred disease, and all diseases are equally sacred," so we may say that "there is no mysterious force, but all forces are equally mysterious." The favorite statement of charlatans, that "electricity is life," is only true in the sense that heat and other forces are essential to life; but none of them can be correlated or transformed into life-force, about which—as of every other form of energy—we know absolutely nothing, except through its manifestations in connection with matter.

**Electrical Measurements.**—The relations of electricity to other forms of energy may be very briefly recapitulated. The prevailing system of measurement in science is based upon what is known as the Centimetre-Gramme-Second system of units, taking the units of length, the unit of weight and the unit of time as the basis of calculation. The amount of force acting upon a gramme of matter so as to produce a velocity of 1 centimetre per second, is the **Dyne**, or centimetre-gramme-second unit of force. The force exerted by gravity upon a gramme of matter at the level of the sea is 980 dynes; or, in other words, 1 dyne equals $\frac{1}{980}$ of the weight of a gramme at the earth's surface. Having determined the value of the unit of force we next find that the unit of work or energy is the work done in exerting a force of 1 dyne over the distance of 1 centimetre, which is denominated the **Erg**, and is equivalent to $\frac{1}{7357500000}$ horse-power. For convenience in electrical calculations, which, with absolute contimetre-gramme-second units, would involve the use of numbers too large for daily use, the Electrical Congress adopted a series of conventional units, consisting of the **Volt**, the **Ampère** and the **Ohm**. "The **volt** is equal to 100,000,000 of ergs, or of absolute centimetre-gramme-second units of force, or 10 to the eighth power (expressed $10^8$); the **ohm** is equal to 1,000,000,000 of absolute centimetre-gramme-second units, or 10 to the ninth power (expressed $10^9$)."

The unit of electrical power is the product of the pressure (electro-motive force) of a current in **volts**, when multiplied by the volume expressed in **Ampères**. The **Watt** is the term used to express this volt-ampère unit of electrical energy. It is equivalent to $\frac{1}{746}$ horse-power (746 Watts equal one horse-power), from whence $\frac{E \times C}{746}$ =Horse-power of any given current. A coulomb is the working unit of electrical energy. When a current having the strength of one ampère passes through a one-ohm resistance-conductor in one second of time, we have an ampère-second, or coulomb, of electricity. It is the unit of measurement of quantity obtained by multiplying the number of ampères by the time in seconds.*

The **Farad** is the unit of capacity. The prefix **mega** means an increase of one million times, and micro $= \frac{1}{1000000}$; they are often used in practical electricity. Thus, the capacity of submarine cables is usually about one-third micro-farad per knot.

**Sources of Electricity for Medical Purposes.**—The chief forms of apparatus for the generation of electrical energy now in use are:—

The Galvanic Cell.
The Faradic Coil.

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* For these definitions the author is especially indebted to the very lucid exposition of the subject contained in "Electricity in its Application to Medicine." By Wellington Adams, M.D. Geo. S. Davis, Detroit. In 2 vols. 1889 and 1890.

The Static Apparatus.

The Magneto-Electrical Machine, or Dynamo.

The Storage Batteries, or Accumulators.

A brief description of the principal forms of these now in use will be necessary in order to understand their further application:—

**Galvanic Cells.**—Galvanic cells are supplied of various forms and combinations, but essentially they are alike, and consist of two plates (generating and collecting) partially immersed in a fluid electrolyte which acts chemically upon one (the positive or generating plate) and also conveys the current across to the other (the negative or collecting plate), as already explained. The great fault of such an arrangement as a source of electricity is that the current is not constant; it may start out with its full strength, but from various causes it soon declines to almost zero. This is found to be due to two principal causes: (1) so-called polarization of the negative plate, by bubbles of hydrogen clinging to the surface, and (2) chemical changes in the electrolyte, its action upon the positive plate making it progressively weaker; and it also offers more resistance to the current because more dense owing to the formation and solution of zinc salt. These objections to the single-fluid batteries have been overcome to a large extent by inserting a porous diaphragm between the two plates and immersing them in separate solutions; thus, in the two-fluid batteries, as they are called, the negative pole is placed in a cup of unglazed porcelain, which when moistened does not obstruct materially the passage of the current. The negative plate is surrounded by a solution which has a chemical affinity for hydrogen, and which acts as a "hydrogen-consumer," thus preventing polarization. As regards constancy, all chemical batteries will gradually run down, although some do so much more rapidly and less regularly than others.

**Different Forms of Cells.**—It has been found that certain forms are better adapted for medical purposes; and, as already explained, the battery must be especially selected for a particular kind of work. Some are made for cautery work, others for neurological and diagnostic purposes, and others still for gynæcological practice, or for charging secondary or storage batteries. Some are portable, others are stationary. The following are the principal forms in use:—

### SINGLE-FLUID BATTERIES.

*The Grenet Cell.*—Positive element, zinc; negative, carbon; electrolyte, dilute sulphuric acid containing chromic acid or potassium bichromate as a hydrogen consumer. The advantage of this form of cell is that the zinc can be lifted, by a mechanical contrivance, entirely out of the fluid when the battery is not in use, or can be immersed to any desired extent according to the amount of electro-motive force required. It is convenient for office work in connection with a faradic coil, or for running a small incandescent lamp. This form of cell is comparatively expensive and has not sufficient voltage for use when a part of the human body is in circuit, unless a large number of cells are used; very compact and useful portable batteries of this kind, however, are now constructed containing from ten to sixty or more cells, twenty-four to forty cells being well adapted for ordinary medical purposes, but not for gynæcological work by Apostoli's method. The solution used is known as the "electropoion" (or electric generating) fluid; it consists of one part commercial sulphuric acid diluted with ten parts of water, to which, after it has become cold, add one part of finely-powdered bichromate of potash and dissolve by agitation. Dr. Seiler, of Philadelphia, recommends the addition of sulphuric acid to a concentrated solution of bichromate of potash, then filtering off the solution after the potassium sulphate has crystallized out, and subsequently adding sufficient water to bring it up to the proper proportion desired. Dr. Adams considers sodium bichromate preferable to the potassium salt.

The *Leclanché cell* has zinc for the positive element, and originally a porous cup containing manganese dioxide and gas-carbon for the negative, with a saturated solution of ammonium chloride as the electrolyte; later forms, such as the Gonda and the Axo substitute large blocks of gas-carbon for the porous cup. This has less electro-motive force, but is remarkably constant and requires very little attention. It is in common use, on this account, for electric bells and other purposes. Where a hundred or more such cells are combined, the voltage, although not great, yet is sufficient for most medical purposes. There is no chemical action in this cell until the circuit is closed. It contains no acids or poisonous solution (except that chloride of zinc is formed in it), it generates no corrosive vapors or offensive odors, does not freeze in winter, and only requires the occasional addition of water or fresh solution to replace that lost by evaporation. One charge of the solution will last from six or eight months to twenty-four or thirty, depending on the amount of use made of it. The Leclanché cell originally consisted of a cylindrical rod of zinc as a positive element, and a porous cell in which the negative element, consisting of equal parts of manganese dioxide and gas-carbon, was packed. In the course of time the negative element had to be renewed. Later forms of this battery, as stated above, simply substitute blocks of gas-carbon for the porous cup, which never need renewing. One form (the Law battery) is of this character and is of excellent construction, the cells being hermetically sealed by a cover, which prevents evaporation and creeping up of the ammonium salts. The electro-motive force is 1.5 volts (1.35 according to Dr. Adams's measurement) and gives a current of one to two and a half ampères *through a short circuit* or where the external resistance is small. This is the best form of open-circuit battery for medical use, according to Adams.

*The Gravity Cell.*—The positive element is zinc and the negative copper ; the electrolyte, dilute sulphuric acid containing sulphate of copper in solution. This is a great improvement upon the old sulphate-of-copper battery, which polarized (ran down) very quickly. A large glass cell is employed, and the copper plate is placed at the bottom of the liquid, or near it, and upon it are placed some crystals of sulphate of copper. Near and just below the surface of the liquid is suspended a horizontal plate of zinc, armed with radii like the spokes of a wheel, in order to expose as much surface as possible to the action of the fluid. The greater density of the sulphate-of-copper solution keeps it at the bottom of the cell, around the negative plate, where it acts as a hydrogen-consumer; whereas, the sulphuric acid, liberated by the decomposition of the copper sulphate, ascends to the positive. The copper separates from the solution in metallic form and is deposited upon the negative plate, while the crystals supply the place of that which was decomposed, and thus keep the solution saturated, making the cell continuous in its action. This form of cell is used for telegraph work, but is not used for medical purposes. It is very uniform in action, but has small electro-motive force ; it is generally worked with a closed circuit, while batteries for medical use are kept usually with an open circuit except when actually in use.

*The Smee Cell.*—Positive, zinc ; negative, silver covered with platinum and with a rough surface to prevent adhesion of hydrogen ; electrolyte, dilute sulphuric acid (1 to 20). This form of battery is almost obsolete in medical practice, although occasionally used in connection with the faradic coil. It has a high intensity, but is not constant. It is useful in the arts for electroplating.

### Two Fluid Batteries.

*The Daniell Element* consists of a glass jar, or receiver, a positive plate of zinc, with a negative plate of copper, the copper plate being placed inside of the porous cup, which contains a saturated solution of sulphate of copper, the zinc being placed in dilute sulphuric acid in the containing jar. Some crystals of copper salt are placed in the interior of the porous cell, to keep the fluid saturated. The internal resistance of this cell is rather high, but is diminished by using large plates and placing them close together. It has an electro-motive force of 1.05 volts, and is quite constant. A modification of this cell, by Siemens and Halske, of Berlin, was regarded by Remak as an improvement, but according to de Watteville, is no longer used. The interior of the porous cell was packed with paper pulp, which, when wet with solution, is a better conductor than the solution alone. It has been superseded by cells of higher electro-motive force and of simpler construction.

*The Grove Cell.*—The generating plate is zinc; the collecting plate is platinum, the latter being immersed in dilute nitric acid (hydrogen-consumer), contained in a porous vessel, and the former in dilute sulphuric acid. The advantages of this battery are its high electro-motive force (nearly two volts), its low internal resistance (usually less than one-fourth ohm), and its simplicity. The objections are its cost, the corrosive fumes which it gives off while in use (nitrous acid), which attack the connections, and, finally, its want of constancy.

*Bunsen Cell.*—This is the same as the preceding, except that a large piece of gas-carbon is made to replace the small platinum plate. The electro-motive force is even higher than the Grove; but the internal resistance is also higher, since carbon is not so good a conductor as platinum. In this cell the bichromate-of-potash solution may be placed in the porous cup instead of nitric acid, thus making it a double-cell Grenet.

### DRY CELLS.

*Chloride-of-Silver Battery of De la Rue.*—Owing to the inconvenience of acids, an effort has been made to do away with them by substituting a paste made of flour and sulphate of zinc, in which the plates (chloride of silver, in the form of a rod, and two zincs) are permanently fixed and the cells hermetically sealed. Although the cells are small, they are able to produce decided physiological effects. The cells are only dry in the sense that they are permanently closed. They each represent an electro-motive force of nearly one volt, and vary in internal resistance from three or four ohms to one-half an ohm, according to size. When used through proper external resistance, these batteries are applicable to many purposes. The chief objection is their high cost and the fact that, when exhausted, they can only be renewed by the maker or patentee.

**The Care of the Battery.**—In order to have the greatest efficiency, it is evident that the battery must be in good working order, the connections perfect, the electrolyte active, and the zinc clean. The best method of keeping the zinc with a clean surface is to amalgamate it with a little pure mercury. This is usually done by scraping away all foreign material with an old file and washing the surface with some weak acid solution (sulphuric or hydrochloric, usually); a little metallic mercury is now dropped upon the surface and rubbed over it with a brush or piece of rag attached to a stick. The zinc, when freshly amalgamated shines like silver, and presents a uniform, amalgam-coated surface. When this is not done the current may be weakened and diverted by what is known as "local action." Small foreign bodies or impurities in the zinc being electro-negative to the zinc, set up little electrical circuits and cause local action, which makes holes in the plate and weakens the current proportionately. No rule can be given as to the time when the zincs should be amalgated or fresh solution used; it depends very much upon the kind of cell and the amount of use, but when the galvanometer shows that the battery is much below its proper efficiency, this attention may be needed to restore it.

**Requirements of a Galvanic Battery.**—Dr. Wellington Adams formulates the following as the theoretical conditions of a perfect battery:—

"1. A high electro-motive force.

"2. A low and constant internal resistance.

"3. A constant electro-motive force irrespective of the current produced by the cell.

"4. A consumption of inexpensive materials.

"5. A lack of consumption of all material when no current is being produced,—that is, when the circuit is not closed.

"6. A ready means of occasionally examining its condition and working and of adding fresh materials when required."

**Work of a Galvanic Battery.**—It should always be borne in mind that the electro-motive force of a galvanic cell is independent of its size, a cell no larger than a thimble possessing as much electro-motive force as one the size of a barrel **where the elements are the same.** The character of the elements, therefore, determines the electro-motive force, or the tension, of the current, all cells having similar elements possessing the same difference of potential. Moreover, one cell will yield the same quantity or volume of current on a short circuit, theoretically, as a hundred, and no more electricity can be obtained from the latter than the former on a **short circuit** (no external resistance). But one hundred cells arranged in series will have a hundred times the power of overcoming resistance of that possessed by one cell. Finally, the strength of a current which any cell will give is largely affected by its internal resistance, this depending upon the size or extent of surface of the elements, their proximity, and the character of the solution and of the negative plate, as conductors, all other things being equal. The **pressure,** or **electro-motive force**, depends upon difference of potential, while the **quantity** of electricity depends directly upon the rate of consumption of the positive plate, or the intensity of chemical action going on in the cell.

**Galvano-Cautery.**—For galvano-cautery work large Grenet cells may be employed. In this case, the external resistance being small, the conjunctive wire being short and a good conductor, everything is gained by increasing the size of the plates and bringing them close together, thus diminishing internal resistance and balancing the battery. Polarization may be prevented by agitating the liquid, or other means. From four to six cells of rather large size are sufficient. A very good mechanical arrangement has been devised, by which the zincs attached to a frame, are raised or lowered by pressing a leaver or treadle with the foot; by this means the battery is only in use for a short period at a time, and polarization has less time in which to take place. The storage battery is also used for galvano-cautery work.

**Faradic or Induction Apparatus.**—The construction of this very useful form of apparatus has already been explained and the theory of its action considered, by which currents of high electro-motive force and small quantity are obtained from those of low electro-motive force with relatively large quantity. Usually one cell of the Grenet or Smee type is used as a source of electricity, which flows along the primary wire. As already stated, the second coil should consist of a large number of spiral turns of fine wire, each insulated from the other; but an extra coil of coarser wire may be used when the external resistance is small. The currents induced by the making and breaking of the circuit in the primary wire, by clock-work rheotome or by the action of the automatic interrupter, are of momentary duration and opposite in direction. In the wires connecting the extremities of the secondary coil, in ordinary medical batteries, therefore, **on a short circuit**, there is, properly speaking, no direction to the currents; they are rapidly-reversed to-and-fro currents. At the same time, they are not of equal strength, and, if the resistance be great, the current set up upon closing the circuit is unable to pass around, and only the current set up at the time of breaking the circuit is left, which, of course, will be in one direction. Moreover, if the interruptions are sufficiently rapid it will be practically continuous. It has already been pointed out that, by a device known as a commutator, the first current may be reversed so as to re-inforce the other; but this is not usually found in medical faradic apparatus. The poles of such a faradic apparatus, may, therefore, be properly marked + and — (or positive and negative), if the currents are all in one direction. In addition to the extra or induced currents set up in the second coil, there are similar induced currents in the primary coil, as its electrical equilibrium is disturbed by the making and breaking of the circuit. If connections are made with the ends of the primary coil this (which is generally, though incorrectly, called by instrument-makers "the primary current") may also be utilized in medicine. The current from this coil differs in several features from the current from the second coil: (1) Owing to the fact that fewer lines of force are involved, the **intensity,** or **electro-motive force,** is much less than in the latter. (2) As at the moment of starting the current the circuit through the cell is shorter than through the electrodes, the first induced current passes through the cell, leaving the second only to pass along the rheophores; therefore, it is an interrupted induced current, all in one direction, and not a to-and-fro current. (3) The current is increased in intensity by inserting a bundle of soft-iron wire in the interior of the coil, or by bringing the secondary coil over it, just as the secondary current is increased.

**Number of Currents from a Faradic Battery.**—Some batteries give only the current from the second coil; some give, in addition, the extra current from the primary coil. The only current of real general utility is that from the coarse and fine secondary coils, having a high electromotive force and small quantity. This is capable of passing through a high resistance, such as that offered by the tissues of the human body; a resistance which would require from sixty to eighty cells of a galvanic battery, arranged in series, to overcome. From this it is seen how futile it is to expect to obtain a galvanic current for medical purposes from the cell or cells accompanying the ordinary faradic instrument. Therefore, medical batteries professing to give, in portable form, both galvanism and induced currents, so as to suit all cases, will not fulfill the requirements of practice. Physicians find it necessary to have both a faradic and a galvanic instrument, or several of different kinds, suited to different cases. With regard to a variety and combination of coils and their effects, we may quote from an article on "The Different Physiological and Therapeutical Properties of the Induced Currents of Electricity" (*Medical Record*, February 14, 1891), by Dr. A. D. Rockwell, who summarizes his conclusions as follows:—

1. From the continuous-coil apparatus, owing to its combination of helices, the wires of which differ in thickness and length, proceed four qualities of current that vary in a most remarkable degree in all the properties of electricity,—physical, physiological, and therapeutical.

2. That the variation is observed most markedly when applications are made internally to the vagina, uterus, rectum, or bladder, by the bipolar method.

3. From the primary or first induction coil we obtain a current of quantity that is barely perceptible externally, but internally, and especially by the bipolar method, acts with greatly increased efficiency.

4. From the combination of the primary and secondary induction coils we obtain a current of greater tension, but which still acts mildly when applied externally. Applied internally, however, its effects are far greater than the first coil, both in exciting the sensibility and contractility, and the utmost caution must be exercised in its use. In the same degree, also, it acts upon the vagina, rectum, bladder, and testes. This current is especially applicable in the treatment of enlargements of the uterus due to subinvolution, but is of little or no value when the enlargement is due to fibrous tissue. It is of especial value in post-partum hæmorrhage, and, from its power to excite the sensibility and contractility of the bladder and rectum, it may be used with good effect when these organs are anæsthetic, or suffer from diminished or lost contractility.

5. From a combination of the first, second, and third induction we obtain the maximum power to excite both sensibility and contractility on the external surface of the body, each additional coil simply giving a decreasing power over sensation and contraction. Applied internally, however, it acts far less powerfully than either of the two previously-named currents; but in the ordinary forms of paralysis of voluntary muscles it will more readily call forth contractions than the current from any other combination of coils.

6. From the first, second, third, and fourth induction coils combined, a current is obtained differing from and superior to all the others in its sedative and general tonic effect upon the system at large. It neither acts upon the sensibility nor muscular contractility when applied externally, as does the third current of the series; nor with a tenth or even a twentieth part of the acuteness when applied internally, that characterizes the second current of the series. For the purpose of general faradization, however, it is the only proper current to use, and for applications to the vagina and uterus, for the relief of many forms of pain, it possesses properties that are invaluable.

**Rapid and Slow Interruptions.**—All faradic batteries are now provided with some form of the magneto-electric, automatic interrupter; although the rheotome, or current-breaker, may also be governed by clock-work, by the hand, or any other convenient method. Ordinarily, the interrupter, or rheotome, is attached to a spring, as already described, and the interruptions occur with such rapidity as to make a buzzing sound or even a musical note. An improvement upon this is found in some first-class instruments, which enables the operator to increase the interval at will between the shocks, according to the case. In some patients, the muscles are thrown into tetanic spasm by very rapid interruptions, and here the slow interrupter is of great service.

**Size of Instruments.**—Faradic batteries are made of different sizes and various shapes. For treatment of cases of poisoning, or in obstetric practice, and, in fact, in many medical cases, the small case, such as the Gaiffé, or one of its modifications and imitations, may be all that is required. But for diagnosis and general clinical use a better one, provided with slow interrupter and a large secondary coil, is indispensable, such as is provided by Otto Flemming, the Galvano-Faradic, the McIntosh Company, and others.

**Combined Currents. Galvano-Faradization.**—No real advantage is obtained by combining the primary and secondary currents in the faradic apparatus; but de Watteville and others have combined the galvanic and faradic currents in order to give greater volume to the latter, and enable it to penetrate more deeply into the tissues.

**The Static or Franklinic Apparatus.**—This is the oldest form of electricity known. It is exhibited when a piece of glass is rubbed with resin, or when vulcanite is rubbed with silk. Now, if either the glass or the resin be brought in the vicinity of some small pieces of paper, or other light objects, phenomena of attraction and repulsion will be manifested. This condition is known as electrification; and it has been found, from various experiments, that:—

1. Articles attracted by the glass are repelled by the resin, and those repelled by glass are attracted by the resin; hence the theory that there are two kinds or components of electricity, called, for convenience, a positive and a negative.

2. Many other bodies, when rubbed together, produce similar phenomena, and become either electro-positive or electro-negative.

3. Articles which give electro-positive electricity when rubbed with one excitant may give the electro-negative electricity when rubbed with something else; so that the form of electrical disturbance depends upon the relations of the bodies which produce it. For instance, glass, when rubbed with resin, produces electro-positive phenomena; when rubbed with fur it is electro-negative.

4. The electrical conditions of both articles are disturbed, and to an equal extent, the quantity of electricity upon the glass rod being exactly equalled by that on the resin or fur.

5. The amount of electrical difference between the two bodies is known as "the difference of potential," since it is the measure of the force which would have to be exerted in order to restore them to their original state of equilibrium.

6. Electrical phenomena are produced in bodies brought into the vicinity of either a positively or negatively excited electrode. This is induction, and the electricity thus caused is known as induced electricity. It is found that, under such circumstances, in a body capable of conducting electricity, the form of electricity will be contrary to that of the electrode, and they will be mutually attracted. Hence the rule, "Unlike electricities attract, like electricities repel, each other."

7. Electricity of this character is confined to the surface of bodies, and can be confined or stored up in appropriate apparatus, *i.e.*, in what is known as the Leyden jar, and is, therefore, known as "static electricity."

8. A body is charged by conduction when its electricity is conveyed to it through a rheophore or metallic connection. It is said to be charged by induction when the electricity is due to the action of surrounding bodies without contact, as already explained.

9. The phenomena of static electricity resemble and are identical with electricity from other sources, when of small quantity and exceedingly high tension (or electro-motive force). The terms positive and negative, therefore, resolve themselves into differences of potential, the current flowing from the higher to the lower potential, as in the current from the galvanic cell.

The foregoing brief *résumé* of the phenomena of static electricity is a necessary introduction to the study of electro-static machines. They consist, essentially, of an apparatus designed to convert motion into electricity by means of friction and induction.

**Forms of Static Instruments.**—Electro-static machines are either **frictional** or **induction** machines, the latter requiring to be independently charged before they will act. Frictional machines are identical in principle with the experiment first mentioned, where glass was excited by rubbing. In its usual form the glass is a circular plate or disk suspended by its centre, and capable of revolving when turned by a crank. It is provided with a rubber or cushion of leather covered with amalgam of tin and mercury, this being slightly pressed against the side of the plate, so as to cause friction when the plate is revolved. There is also a comb of metal, the points of which do not quite touch the surface of the plate. The cushion and comb are connected by means of metallic conductors, each with one of a pair of brass balls, which are the poles or electrodes of the apparatus. When the glass disk is revolved the rubber excites positive electricity upon the glass surface, and is itself negatively excited; owing to the amalgam, its charge is carried to the electrode in connection with it. The surface of the glass which is positively excited passes under the comb, which conducts the charge of positive electricity to the brass ball corresponding with it. The charge of positive electricity steadily increases, until the difference of potential is so great as to cause a disruptive discharge between the two poles. This temporarily restores the equilibrium of the glass, which passes again under the rubber and the phenomenon is repeated. The pole in connection with the comb which is positively excited will, if brought near the negatively excited pole, discharge itself as a spark passing between the poles, when the difference of potential is sufficient to enable it to jump across the intervening space. If it is desired to apply this form of electricity to medical purposes light brass chains or other conductors are attached to the poles, and by means of suitable electrodes sparks may be drawn from different parts of the human body. If we insulate the patient by seating him upon a chair with glass castors or a stool supported by glass, we may connect him with either pole, the other being grounded, and he will become stored with either positive or negative electricity, and sparks may be drawn by bringing the opposite electrode, or any object by means of which communication may be had with the earth, near him. Other applications besides this so-called electric bath will be mentioned farther on.

**The Holtz Machine.**—The improved Holtz apparatus is at present the best of the induction or influence machines. It consists essentially of two varnished-glass disks,—one being stationary, the other revolving. The stationary plate has two apertures, through which project the ends of two strips of paper, called **inductors,** which are attached to the outer side of the plate. The free extremities of these inductors emerge upon the inner side opposite a pair of metal combs, each connected by a metal rod and by a conductor with one of the poles. The action of the machine is thus explained: "Let one of the inductors be charged,—say, positively,—and let the two electrodes be brought into contact. As a result, the comb opposite the inductor is charged negatively by induction and a positive charge appears at the other comb, since the combs are in communication through the joined electrodes and the positive electricity is repelled away from the inductor itself. Since the combs consist of sharp points, the negative electricity upon the first comb begins to discharge itself against the glass plate in a direction toward the other inductor and comb. Both of these, therefore, discharge positive electricity on the plate,—the comb upon one side, the inductor upon the other,—while the inductor itself receives a negative charge. Clearly, therefore, a part of the negative charge upon the front of the plate is neutralized, and the positive charge upon the back is carried around again toward the positive inductor. This increases the action of the positive inductor, since the inductor itself discharges negative electricity upon the plate and becomes itself more and more strongly electrified positively. If the electrodes are now separated sparks will pass between them"* when the plate is made to revolve. The object of having the holes in the stationary plate is to diminish the capacity of those parts of the plate which are opposite them, and thus cause them the more readily to give up some of their charge. In some cases Leyden jars are attached to the electrodes, the object being to increase the energy of the sparks given off, and, in fact, make it resemble the induced current.

**Magneto-Electricity and Dynamos.**—The fact that a magnet introduced into the interior of a coil of wire is capable of disturbing its electrical equilibrium and instituting electrical impulses has led to the construction of medical electrical machines, in which coils of wire, attached to a revolving frame, are made to rapidly pass through the lines of force around the poles of a large magnet. Currents are set up in the coil as it enters and as it leaves the magnetic field, and by proper connections these currents are conveyed to electrodes, by which they can be applied to the body. These currents are of high tension, but of feeble quantity—resembling, in this respect, the Faradic machines, which are much more efficient and convenient, so that they have driven the others out of use. Within a few years, however, improvements have been made in the construction, and large magneto-electrical machines are made, which are run by steam and are called dynamos. They are now employed in electric lighting, and, as a source of power, for many purposes. The wires carrying these currents in the street-mains have been utilized as a source of electricity for medical purposes, and we may briefly refer to the subject here. There is a distinction of great importance to be observed between the currents supplying the arc light and the incandescent light; the former requires a 10-ampère current, with electro-motive force of about 60 volts, while the latter has something like one-half ampère, with an electro-motive force of 110 volts. Owing to this difference in quantity and pressure, it is easily seen that their utility for medical purposes varies greatly. The arc-light current is capable of causing fatal results, while no serious result would follow the use of the incandescent (Edison) current, **unless it was accidentally connected with an arc current flowing in a neighboring wire,** in which case its current would be immediately increased, and, unless protected by a previous insertion of a fusible plug in the circuit before reaching the patient, serious results might follow. Where an arc current only is available, it is conducted through what is known as a "converter," which is essentially a coil of wire surrounded by a secondary coil, from which the induced current, having higher intensity and less quantity, is obtained just as in the Faradic apparatus. It is not necessary to discuss the construction of motors and dynamos, nor the different methods of arranging the wires in the armatures, in order to obtain currents of higher or lower potential.

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* Liebig and Rohé, "Practical Electricity in Medicine and Surgery," p. 27. The F. A. Davis Co., publishers, Philadelphia, 1890.

For these details the reader is referred to Liebig and Rohé's work on "Medical Electricity," to which reference has already been made, and other monographs on medical electricity, electric lighting, etc. Small dynamos have been constructed for use in clinical work, but they are expensive, unreliable, and unsatisfactory, when compared with galvanic and static machines now furnished. The electric-light current may be utilized by physicians for running small electric motors for dental drills or nasal instruments, and for running the static machines, and other purposes. It is also made available and portable for medical use as a source of electricity, through Faure's invention of the storage battery, in which the current is completely under control.

**Storage-Batteries, or Accumulators.**—While the Leyden jar, one of its modifications, is the only means, strictly speaking, for accumulating electricity, the name of storage battery has been, by general consent, applied to a form of apparatus in which chemical action produced by a current of large volume and low pressure is utilized to yield, at will, a current of low volume and large electro-motive force. The form known as the Planté cell originally consisted simply of two insulated plates of lead immersed in dilute sulphuric acid. If, through this apparatus, a current be passed for a certain length of time, it will be found that certain chemical and physical changes have taken place, and one plate is seen to be covered with a layer of oxide of lead. Now, if the current be reversed, the other plate will become oxidized, and the first plate will be deoxidized and again become metallic lead, but the surface will be converted into a spongy condition. The plates are now said to be "formed," the spongy lead being the negative plate and the oxidized the positive —the current, in other words, flowing from the plate containing the oxide through the circuit, or conjunctive wire, and into the cell through the spongy plate. During the process of charging the cell the current is made to flow in the opposite direction—into the cell through the positive plate, and out through the other. After charging, the positive plate is still more oxidized. Subsequently, when the circuit of the cell is closed, a current is set up, which continues as long as there is sufficient difference in potential between the plates to overcome the resistance, and during this time the positive plate becomes progressively less and less oxidized, and the negative more. In the present form of the Faure cell, the lead plates are cast in moulds, which give the plates a peculiar shape. They are called "grids," because they contain numerous holes or perforations, which are to be filled with oxide of lead, mixed into a paste with sulphuric acid. Two oxides are employed,—the red oxide ($Pb_3O_4$) for the positive plate, and yellow oxide (PbO) for the negative. After the plates have been thus prepared, they are "formed" by passing a current obtained either from the electric-light main or battery, of proper intensity, through them, when immersed in dilute sulphuric acid. When several storage cells are used, they are always coupled in parallel, the positive plates all being joined together by a lead strip, and the negatives similarly united. In this way, each additional cell proportionately diminishes the internal resistance. The storage cell is largely used in medicine and surgery, in connection with the galvano-cautery, dental engine, or drill, and electric light for exploratory purposes. It is usually found convenient to use from four to six cells. They may be charged either from a large galvanic battery (sixty to one hundred cells), or from the Edison incandescent electric-light current. Storage cells each represent an electro-motive force of about 2 volts. When in use, as soon as the electro-motive force falls to 1.8 or 1.7 volts, the battery should be disconnected, and at once recharged. It should not be allowed to run down further than this, and should not be permitted to remain, when not in use, in an uncharged state, for it will lose in efficiency, if neglected. The capacity of a storage battery is usually indicated in ampère-hours,—that is, by the number of hours it will furnish a current of given intensity. A battery with a capacity of 100 ampère-hours, theoretically, will furnish a current of 10 ampères for ten hours, or of 5 ampères for twenty hours, etc. In practice, however, the capacity diminishes with the intensity of the current; so that the above battery might furnish 25 ampères for only three hours, instead of four, or 50 ampères, possibly, for only one hour, instead of two. The size of the cells and their number are made to correspond with the particular work they are intended to perform, as the best work can be done only when a battery is discharged at its "normal" rate,—that is, the kind of work that it was made for. The cells may contain a number of plates, thus greatly increasing the surface exposure and diminishing the resistance. The objection to storage batteries is their weight, but recent improvements have been made by which both the weight and cost have been materially reduced.

**Electrical Apparatus Other than Batteries—Electrodes, etc.**—In addition to a source of supply of electrical energy for medical use, certain apparatus is needed. The rheophores, or current carriers, have already been mentioned. The electrodes or poles are of different shapes, adapted to the part of the body they are intended to be applied to. As metallic electrodes cause pain when strong currents are used, it is customary to cover the electrode with a moist sponge or leather; what is better, is a layer of absorbent cotton, and moistened with salt water because it is a better conductor than plain water. Where large-volume currents are used it is necessary to increase the size of the electrode in order to avoid electrolysis of the tissues; for instance, in the Apostoli method one of the electrodes is made of a mass of clay applied over the surface of the abdomen, while the other, being comparatively small, is usually made of carbon, and is applied so as to produce the desired local effect upon the uterine structures. Electrodes for cautery purposes are usually made of platinum, in the form of loops of wire of different sizes, according to their destined purpose. The wire may be used as an écraseur, and heated to the desired degree by the current as it cuts its way through; but much tension cannot be put upon a wire that is heated, because it is soft and less able to resist when in this condition. The electrodes ordinarily employed for the percutaneous method of administering electricity are of great variety of shapes, varying with the taste of the user. They may be double, each pole being insulated until joined by some object, such as the mucous membrane; these are used for intra-uterine, laryngeal, or eye work. A similar electrode is used as a searcher for bullets, an electric bell being placed in circuit, which rings when metallic connection is made.

**Galvanometers, Milliamperemeters, or Milliammeters—The Dynamometer and Coulombmeter.**—Besides batteries and electrodes, an instrument for measuring the quantity or intensity of a current is needed. The galvanometer if constructed upon the principle of the deflection of a magnet, by the passage of a current of electricity parallel with it. A magnetic needle surrounded by a coil of insulated wire will be deflected from its usual position in relation to the earth's magnetism (north and south) and made to revolve more or less to a position approximating a right angle; the greater the strength of current, the greater the deflection, although not directly related, since doubling the current does not double the amount of deviation. As the galvanometer is marked in milliampères, it is commonly known as the milliampèremeter, or, abbreviated, simply milliammeter. Such an instrument is called direct reading if it indicates at any moment the strength of current in ampères. Very good instruments are made by Waite & Bartlett, Fleming, and by McIntosh. Wellington Adams pronounces in favor of the Weston milliammeter. For exact measurement of electrical work a **coulombmeter** is used, which depends upon the amount of decomposition or electrolysis taking place within a certain time while the battery is in use. An instrument of this kind is used in connection with the electric lamps, to discover at stated periods exactly the quantity of electricity which had been used. Besides these, practical electricians make use of another instrument, known as the **dynamometer.** In this instrument the amount of attraction between coils of wire, carrying currents in the same direction parallel with each other, is measured by the amount of angular deflection. In the dynamometer, instead of a magnetic needle, we have a coil of wire to be acted upon. When the current is reversed it is changed simultaneously in both coils, and the same effect is produced as when the current was constant; hence, with this instrument, we may measure the strength of alternating currents, which could not be done with the ammeter. The deflection of the dynamometer is proportional to the product of the two currents; consequently, in order to determine the strength of the current itself, it is necessary to take the square root of the amount of the anterior deflection of the suspended coil.

**Different Forms of Rheostat for Determining Resistance.**—A form of apparatus for accurately measuring resistance, or **ohm-meter**, consists of a box containing a number of coils of wire, the resistance of which is definitely known, which can be introduced into the circuit either in connection with the unknown resistance or in substitution for it, the latter being a more direct method. The apparatus commonly used for this purpose is known as the "Wheatstone bridge."

A **rheostat** consisting of a column of water in a glass tube, or a series of resistance-coils, or a mass of plumbago,* as in the Massey current-controller, is almost indispensable in using the galvanic current, since by its means the entire battery of forty to eighty cells is brought into action at once, the current being gradually raised from zero to the desired amount and afterward lowered again before removing the electrodes.

**Labile and Stabile Applications—Ascending and Descending Currents—General Faradization and Galvanization.**—When the electrodes are kept upon certain spots, the application is said to be "stabile"; when they are moved about, it is a "labile" application. When the poles are so placed that the current passes toward the periphery, it is said to be **descending**; when reversed, it is **ascending**. This applies both to the faradic and galvanic currents. In general galvanization a moist foot-plate or foot-bath may be attached to the negative electrode, while the positive, covered with wet cotton, is held to the forehead or occiput. The caution is given by most electro-therapeutists not to use very strong currents if the head is in the circuit, nor to abruptly make and break or reverse the current; nor should the application be kept up for a longer time than five to eight minutes. General faradization is accomplished by applying one electrode to the spine, in the cervical or dorsal region, and passing the other rapidly over the surface of the extremities. It is often, and very advantageously, combined with massage.

**Rheotome.**—A mechanical device for interrupting the galvanic current is called a rheotome, and is an indispensable part of the outfit, as furnished by the principal manufacturers. The slow interruption may be made mechanically,—by the hand or foot or by clock-work,—but the automatic interrupter is most commonly used. The same result may be accomplished, though less satisfactorily, by brief applications, simply "dabbing" one electrode on the part, the other being stationary.

**Current-Collector, or Pole-Board.**—In a complete battery outfit it was formerly considered absolutely necessary to have what is called a **collector**, which represents the extremities of the wires communicating with the cells, so that by simple movement of a switch any number of cells are thrown into circuit. The simplest form of collector is in the shape of a dial, consisting of a single row of metal buttons arranged in a circle. In the centre is a metallic post, which has a movable arm which swings around the circle, bringing into action as many as are required, the buttons having a circle of numbers just outside of them corresponding with the number of cells. If the arm of the dial-collector be sufficiently wide to touch two adjoining buttons, breaking the current will not occur when the arm is moved from one to another. With a large battery two dial-collectors are employed,—one representing single cells, the other accessions of two, three, or five cells. Since the introduction of the milliammeter and the rheostat, or current-controller, the necessity for a pole-board collector is much less imperative, and it may be entirely dispensed with without inconvenience.

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* A plumbago current-controller was patented by Dr. John Butler, author of "Electro-Therapeutics and Electro-Surgery," Philadelphia, 1879 and 1882.

**The Current-Reverser.**—The **commutator,** or pole-changer, is also a valuable, if not indispensable, adjunct to a good battery. It is a mechanical contrivance, by means of which the polarity of the electrodes may be reversed without changing their position. This may be done by a simple switch; but, where rapid reversals are required, the best form is a split button. The revolving shaft carries a disk bound with brass, in which there are two interruptions of continuity or vacant spaces. Upon the circumference four flexible metallic connections impinge, so that, as the handle is turned, the poles are brought alternately in connection with each electrode. The ordinary pole-changing switches have adjustable contact-springs beneath the levers, which make close contact with the buttons beneath, the surface of which should be kept clean and bright. By employing two pole-changing switches, one connected with a galvanic and the other with a faradic battery, the change may not only be made from one polarity to another, but also from the chemical to the induced current, without removing the electrodes. Such a switch-board, as first devised by de Watteville, and known as a "current-alternator, reverser, and combiner," is manufactured by Messrs. Waite & Bartlett Company.

**Some Points with Regard to Electrodes.**—With regard to electrodes, Erb recommends the following standard sizes:—

1. Fine electrode, ½ centimetre (⅕ inch) in diameter.
2. Small electrode, 2 centimetres (¾ inch) in diameter.
3. Medium electrode, 5 centimetres (2 inches) square.
4. Large electrode, 6 by 12 centimetres (2½ by 5 inches).
5. Very large electrode, 8 by 16 centimetres (about 1¼ by 6½ inches).

The electrodes may be made of carbon (gas-coke), copper, or lead. When a dry electrode is required carbon is preferred; it also makes a useful form for intra-uterine applications. Where a large surface is to be covered sheet-lead may be employed on clay, as used by Apostoli. Electrodes are often covered with leather or sponge, but the most cleanly and convenient covering is absorbent cotton, as suggested by Dr. G. Betton Massey, a fresh piece being applied over the electrode for each *séance.* The cotton is moistened with warm water, or with medicated solutions if desired for cataphoric purposes. Various forms of electrodes have been devised for laryngeal, intra-uterine, and other special purposes, which fill up the pages of the manufacturers' catalogues, and need not be detailed here. An exceedingly compact and complete electro-therapeutic cabinet, having galvanic, faradic, and static apparatus, with all the needed accessories, in a space of thirty-four by twenty-four and sixty inches high, has been devised by Dr. Wellington Adams, of St. Louis, Mo. It is not only an ornament to a physician's office, but he claims that it is really the most useful cabinet that has yet been produced.*

**Physiological Effects.**—The utility of electricity in medicine depends upon its power of producing physiological effects and stimulating certain functions. It is known that all muscular movements are attended by the liberation of electric currents, and, in fact, a form of battery may be made entirely of muscles, as in Galvani's celebrated experiment. On the contrary, currents of electricity, made to traverse a muscle in its normal state, will produce contractions. In the same manner, if an electrical current be applied to a motor nerve, by introducing part of its trunk in the circuit, the muscles to which it is distributed will contract; sensations of pain or numbness will be caused by stimulating a sensory nerve; a peculiar taste in the mouth is caused by passing electricity through the gustatory nerves; sensations of flashes of light are caused by electrically exciting the optic nerve, etc. So that properly adjusted currents of electricity cause responses in accordance with physiological function of the organ to which they are applied. Very little is known with regard to the electrical condition of the deeper tissues of the interior of the body during the period of the passage of a current of electricity between the positive electrode (or anode) and the negative (or cathode), when they are applied to the surface of the body. If the electrodes are dry, the galvanic current penetrates with difficulty, since the dry skin offers a very high resistance, and is a poor conductor of electricity. If the electrodes are moistened with salt water, a small portion of the current passes directly through, from one to the other, in a straight line, but the major portion is deflected by various routes of less resistance, a considerable quantity probably following the layer of fascia and blood-vessels under the skin.

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* See "Electricity: its Application in Medicine," by Wellington Adams, M.D., vol. ii, p. 33. George S. Davis, publisher, Detroit, Mich., 1890.

When a nerve-trunk is included in the path of the current, the part of the nerve near the anode is in a condition of decreased irritability and that near the negative of increased irritability. In the normal condition the greatest effect, therefore, is observed under the cathode, or negative pole. By numerous experiments it has been found that the contraction occurs with the weakest current, with cathodal closing; the anodal-closing contraction requiring twice the strength of current; the anodal-opening contraction about the same; while the cathodal-opening contraction requires four times as much. This may be expressed in symbols as follows:—

Normal nerve-muscular reaction $= Ca\ Cl\ C > An\ Cl\ C > An\ O\ C > Ca\ O\ C$. The changes in the electrical irritability of nerve and muscle are classed by Liebig and Rohé under three heads:—

1. Quantitative, or an increase, diminution, or total disappearance of electrical irritability to one or both currents.

2. Qualitative, consisting in a modification in kind of the normal reactions of nerve and muscle to electrical currents. This is the so-called "reaction of degeneration."

3. Mixed or combinations of quantitative and qualitative variations of irritability. This class may also be included under the consideration of "reaction of degeneration."

The reaction of degeneration of Erb indicates a departure from the normal conducting power of the nerve and muscle, and this is usually the result of degeneration of the nerve, but it may be secondary to some lesion of the spinal cord at the point of origin of the roots of the nerve. The phenomena of reaction of degeneration are:—

Disappearance or diminution of nervous irritability to both galvanic and faradic currents.

Disappearance of faradic and increase of galvanic irritability of the muscle, generally associated with increased mechanical irritability.

Tardy, delayed contraction of the stimulated muscle, instead of the quick, lightning-like contraction of the normal muscle.

Appearance of certain decided changes of the normal formula, as just given, to $An\ Cl\ C > Ca\ Cl\ C > An\ O\ C > Ca\ O\ C$, or some modification of this. But the typical change is the tardiness of muscle-contraction, which indicates degenerative changes of the muscle or nerve, following peripheral paralysis.

**Monopolar and Dipolar Electric Baths.**—The dipolar electric bath is essentially different from the franklinic electric bath (general franklinization), in which the patient is placed upon an insulated chair or stool and connected with one (negative or positive) pole of a static or friction apparatus. The results of some recent experiments are reported by W. S. Hedley, M.D., in the *British Medical Journal* (February 20, 1892, page 381), in which the effects of the bath are carefully studied. For the dipolar bath the following apparatus is required: An oak bath-tub six feet long, two feet six inches wide at widest part, the waste-pipe being insulated from earth by a short length of rubber hose inserted near the bath; a battery of seventy-four Leclanché cells, or other battery, having an electro-motive force of seventy-five volts; the electrodes, thirty by twenty square centimetres, rest at each end of the bath; the water is unmedicated, about twelve and one-half inches in depth, and the temperature 98° F. The resistance of the water before the entrance of the patient measures 165 ohms, but increases rapidly as the water cools (thus, at 92° F. it is 194 ohms; 87° F., it is 264 ohms; and at 70° F., 440 ohms). A strap is stretched across one end as a head-rest, and the subject lies immersed in the water except his head, the shoulders being eight inches from the positive electrode and feet three inches from the negative. It was found by measurement that a small portion of the electric current (or lines of force) pursued the most direct course through the patient's body; upon measurement, however, it was found that the strength of the current which thus passed through the tissues was less than one milliampère; the waste of current in administering a dipolar electric bath is, therefore, much in excess of what is generally supposed. In proper hands this method of administration is an available method of general galvanization; if painful at all it is at most only pleasantly painful, and, on account of its wide distribution and even application, it is a good method for appropriate cases. The question of density becomes a complicated one in this form of bath. Here it is evident that not only the size of the electrode is to be considered, but the amount of diffusion the current undergoes in passing through the water from the electrode to the body. This depends partly upon the size of the electrode, partly on the distance, and partly on the conductivity or the specific resistance of the water. In other words, says Dr. Hedley, "we have not only to consider the size and position of the electrodes electrizing the water, but we have to look upon the whole extent of water in contact with the body as a huge electrode, carrying a widely diffused current with a density, of course, diminished in proportion to its diffusion."

Various other forms of electric bath are in use; for instance, in what is termed the needle bath, where the patient is surrounded by coils of pipe containing minute perforations through which water flows with force against the surface of the skin, he may be placed upon an insulated mat connected with one pole of the galvanic or faradic battery, while the other is connected with the water-pipes; in this way the current is carried by the water acting as an electrode. Where one electrode is held by the patient, applied directly to different parts of the body, the other being immersed in the bath, we have what is called the monopolar bath. The monopolar bath is not as well adapted to the treatment of disease as the dipolar, according to Stein, because of the great difference of current density between the immersed surface and that part to which the other electrode is applied. Eulenberg considers it quite unsuited for scientific work. In the dipolar bath the current density does not fluctuate, and polarization is at the minimum. Bartholow thus sums up the effects of the dipolar bath: In faradic baths of ten minutes' duration the electric sensibility is increased, whilst a distinct diminution of motor excitability takes place. The cutaneous sensibility to faradic stimulation is for a brief time increased, but afterward considerably lessened, whilst to the galvanic the diminution of cutaneous sensibility occurs at once, and is maintained throughout. At first, both in faradic and galvanic baths of moderate strength, the frequency of the pulse is lessened, after a time to return to the normal. With a powerful and long-continued current-action the frequency of the pulse increases during the bath, the tension of the vessels is elevated, and sometimes there is irregularity in the action of the heart. As respects the respiration in dipolar baths, galvanic and faradic, the number of the respirations is increased and in volume deepened, whilst in monopolar this effect is much less pronounced. The temperature is little affected in dipolar baths, but is lowered in monopolar. As respects the excretion of urea, the effect of the dipolar bath, galvanic and faradic, is much greater than the monopolar. All forms of electric baths stimulate the appetite, increase the digestive power, promote intestinal peristalsis, and affect agreeably the mental state; also sleep is promoted, and various functional nervous affections improved. The difficulties of administration of the various forms of electric baths are such that, unless they can be proven to enjoy marked therapeutic advantages over other forms of application of the current, they can never obtain much prominence in therapeutics; however, as they combine, to some extent, the advantages of hydrotherapy with electricity, they possess peculiar value for institutions in which the proper apparatus is at hand for the purpose.

**Electricity in Medicine.**—Electricity, as a therapeutic expedient, belongs to a division which is quite distinct from the ordinary classes of remedies. The various well-known forms of energy,—heat, light, motion, and electricity,—when considered as therapeutic agents, may be grouped together, for convenience, as "imponderables," or simply as "forces." The distinction is very marked between material substances, like **drugs,** which temporarily become a part of the human body, and during this time affect certain functions and produce disturbances of nutrition, which may or may not be ultimately beneficial, and **forces,** which directly act upon tissues and cells, exciting normal irritability of muscles and nerves, and, when properly and successfully used, aiding the functions of organs and strengthening vital powers. Electricity cannot therefore, be considered as a department of the Materia Medica; it must be studied as a science by itself; but its application is an art which must be learned mainly by the bedside and from experience.

**Different Effects Depending upon Various Modes of Application.**—Electrical currents are applied through a greater or less extent of the body, according to the relative position upon the suface of the electrodes between which the force is technically considered as flowing. The effects vary according to conditions; they are classed as irritative (or excitant), electrolytic, thermic, cataphoretic, and catalytic. The latter word is rather uncertain in its signification; but it is a convenient term, under which may be included the actual, but not easily demonstrable, dynamic molecular action of the current, which has been already referred to in the preceding pages and which possesses a powerful influence in correcting perverted physiological processes and in restoring parts to a normal state. In ordinary medical applications of electricity,—as, for instance, in treating paralysis of certain muscles,—this dynamic or catalytic effect usually predominates over the chemical and electrolytic actions, the latter requiring, for their production, much more powerful currents than are ordinarily employed by physicians. The **effects** of the electrical current are, therefore, dependent upon the manner and method of its application. For instance, if we desire to obtain the electrolytic and cataphoretic effects of electricity we employ a galvanic current of low potential, as in treating urethral or other strictures by the method of Dr. Newman, of New York.* Here, moist mucous membrane being in contact with the electrode (negative), the energy of the current meets comparatively little resistance and becomes concentrated upon a very small area, where it produces decided electrolytic and chemical effects. On the other hand, in ordinary medical applications, where the percutaneous method is followed, the dry, horny layer of the skin offers great resistance to the passage of the current; hence the skin must be moistened, because moist tissues carry the current better than dry ones. When the current is diffused over a large surface by using large electrodes, it has its density greatly reduced, and the local effects are consequently less marked. Small electrodes, on the contrary, concentrate the effects. For the production of chemical changes, a degree of intensity of the current is required which is highly dangerous to the integrity of tissues, especially of the nerve-structures; therefore, measures are adopted for limiting the effects to the immediate neighborhood of the electrode. In the Apostoli method one very large, external, abdominal electrode is employed, which diffuses the current at one pole, whereas it is concentrated around the other pole by the use of a comparatively small intra-uterine electrode. Since, even in the Apostoli method, where heavy currents are used, no **chemical** changes in the blood or intervening tissues, except in the vicinity of the electrodes, have been noticed, it follows that chemical changes are not to be expected from the usual manner of applying this valuable therapeutic agent by currents used for medical purposes. Molecular or **physiological** change, however, does take place, as is shown by slight increase of temperature and improved nutrition and power in parts under treatment. This is explained by the hypothesis that the ultimate forms of matter—the atom and the molecule—represent force in perpetual action, and this motion takes place according to certain fixed laws. This is equally true of the molecules composing the human body, where the motion is also directed by physiological law. Now, the electrical current undoubtedly influences molecular motion, and produces polarizing effects which, within limits, are strictly physiological; for this effect we have no better term at present than to speak of them as the results of the dynamic molecular influence of the current, or "electrical catalysis." The passage of a current of electricity, of either high or low tension, may be supposed to produce a tendency to polarization of molecules, all the electro-positive atoms, as far as possible, arranging themselves in series with the electro-negative bodies, so as to form a sort of chain of molecules of alternating electrical affinity, extending between the poles, when a portion of the human body is in circuit. As previously insisted upon, no actual flow of anything occurs, but successive waves of energy, when the circuit is closed, follow one another along the conductor, and from the positive electrode to the negative, through the tissues. These dynamic impulses, if sufficiently intense, or, in other words, if the current be strong enough, are capable of rupturing the bond between the molecules of the tissues and causing chemical change (**electrolysis**) and devitalization. In the latter case a blister and an eschar or slough (**electrocausis**) may be formed in the immediate vicinity of the electrodes and a burn of more or less depth result. Electricity of high pressure may also act upon the nerve-centres directly and cause death, as by a lightning-stroke, without producing lesions upon the surface of the body. Much lower degrees of electrical energy are employed in medicine, which, however, can be maintained within safe limits, and which produce only physiological and therapeutic effects.

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* See Clinical Lecture reported for the *Medical Bulletin.*

**Physiological Effects of Currents of Electricity.**—A current of ordinary strength from a galvanic battery, passing along a motor nerve and muscle, causes contraction of the muscle at the time of making and breaking the circuit; but during the time the current is passing uninterruptedly no motion occurs. The nerve, at this time, is in a peculiar state or condition known as **electrotonus**. According to Pflüger, the portion of the nerve in contact with the anode (positive) loses its excitability and is in a condition termed **anelectrotonic**; the portion in contact with the cathode (or negative pole) has its excitability temporarily increased, and is said to be **catelectrotonic**. The anelectrotonus and catelectrotonus exist for a short distance from the point of contact of the poles, and are increased, with the augmentation of the current, up to a certain point, when they disappear. Bartholow accounts for this condition on the hypothesis that the chemical constituents of the nerve-trunk obey the laws of electrolysis, by which alkalies and hydrogen will appear at the negative pole and acids and oxygen at the positive, the effect upon the nerve being to a certain degree chemical. Where rapid reversals are made the muscles to which the nerve is distributed will be thrown into tetanic contraction (tetanus), and a similar condition occurs in certain morbid states from the application of faradic currents of moderate strength. This is especially likely to occur with the automatic, rapid interrupter, or rheotome, and this makes it necessary to have, for examination of such cases, a mechanism capable of making slow interruption of the battery-current in the primary coil, thus giving the muscle time to recover itself between the shocks. The faradic current is more irritating and stimulating than the galvanic; but when the interruptions are very rapid (from one hundred to two hundred per second) the faradic secondary current becomes sedative; and in many cases the anode relieves pain more quickly than the cathode. The very rapidly interrupted faradic current exercises an anæsthetic effect upon the peripheral nerve-endings, as demonstrated by the late Dr. Hutchinson, of Providence, R. I. The influence of electrical stimulation upon the nutrition of muscle has been experimentally studied by Debedat. The results demonstrated a gain of 40 per cent. in the weight of muscles stimulated by means of an induction-coil current so arranged by alternating shocks and intervals, as to approach the condition of a muscle during the performance of rhythmic gymnastic movements. A galvanic current with alternate periods of stimulation and repose caused a gain of 18 per cent. in weight. Prolonged tetanization of muscle without intervals of repose by the induction coil occasioned a loss of weight. The gain in weight was due to a true increase of muscular tissue while the loss depended upon destruction of muscular fibres. From experiments upon his own person Truchot observed that the effect of static electricity is to increase tissue metabolism and to influence it unfavorably, but concludes that in patients who suffer from imperfect metabolism, especially neurasthenics, the augmented change is beneficial.

**Methods of Electro-Diagnosis in Various Nervous Affections.**—In studying the effects of brain-lesions and nerve disorders, proper apparatus is essential to determine differences in reaction and other evidences of departure from the normal standard. For electro-diagnosis we require each of the above-mentioned forms of current. The faradic coil should be constructed upon the Du Bois-Reymond pattern, in which the primary coil is of good size, and there should be at least two secondary coils,—one of fine wire and the other less fine,—and a scale in millimetres should be so placed as to indicate the position of the secondary coil, as related to the primary. The current is supplied usually by a single acid cell, of 1½ or 2 volts, or two cells may be used of the Leclanché pattern. The external resistance being small, there is no advantage in having a larger number of cells, although, where a large coil is used for diagnostic purposes, two cells of the Law pattern are preferred by Dr. Walling, who also points out that the dry cell is not suited for this work. In all faradic machines, when in use, the cell is on a short circuit; hence the dry cell, having a tendency to rapidly polarize, soon runs down, and the battery will not again work until the cell has time to recover. The dry cell, however, is very convenient, in small, faradic batteries, for medical use, where the instrument will only be in operation for fifteen or twenty minutes at a time. To return to the large coil for diagnostic purposes, we find an advantage, as previously shown, in having the apparatus supplied with a slow, as well as a rapid, interrupter; and, for exact work, a clock-work rheotome is an advantage. With such an apparatus, muscular contractions may be obtained in some cases, in which no response will follow when the very rapid interruptions are made; or the latter may simply throw the muscle into tetanus, whereas, the slow interruptions permit the muscle to recover itself between the successive contractions.

As previously explained, in the induced current from the primary coil, the impulses follow each other in proportion to the rapidity of the interruptions; but they are all in one direction, that is to say, that they consist only of the currents set up by breaking the circuit, since those made by making the circuit **are short-circuited through the cell.** Therefore, there is a decided difference between the poles of the primary coil, and they may be marked anode and cathode, stronger contractions being obtained with the same strength of current when the cathode is placed over the muscle at the motor point, or on the nerve.

With the secondary coil, which furnishes the to-and-fro current, it is usually stated that there is no difference between the poles and no polarity. This is not strictly true, since the currents made upon breaking the circuit are more powerful than those set up when the circuit is closed; consequently, the current in one direction will be stronger than the other, and polar differences will be noted. Moreover, where the secondary coil is very long and the wire very fine, the resistance may be so great that the weaker current will not be able to pass through the additional resistance of the human tissues, and consequently we may get effects due solely to the stronger current, and the electrodes will then show anodal and cathodal differences, just as with the primary coil. The same result may be obtained from the secondary coil by the use of a commutator, as in the Ruhmkorff coil, by which both currents are made to flow in the same direction. Therefore, practical electricians who claim that there is a difference between the polarity of the electrodes from the secondary coil are quite correct, and those who maintain that there is no difference are in error.

The size of the electrodes is of importance. The indifferent electrode should be rather large, but the active electrode should be small. Erb prefers one of ten square centimetres; Stintzing uses electrodes of less than one-third of this size,—from one-third to one square inch of surface. The electrodes are provided with handles of non-conducting material and of convenient shape; they have their metallic extremities covered with leather, or, what is better, absorbent cotton, thoroughly wet with a saline solution, so as to favor the passage of the current through the skin. In order to obtain results for comparison, we not only note the number of millimetres of coil distance, but we also use the same electrodes, moistened to the same extent and applied to the same spots with equal pressure.

For general diagnosis, the patient, with as little clothing on as is convenient, is made to sit upon a stool, and a large flat electrode (positive, or anode), covered with a wet napkin or absorbent cotton, is applied to the sacrum, or the patient may be allowed to sit upon it. If this is inexpedient, the feet may be placed in a basin containing warm water, in which the electrode is placed, connected with the secondary or primary coil of a faradic apparatus. The operator then applies the smaller (cathodal) electrode to the spine, commencing with a moderate current, and slowly carrying the electrode down the patient's back, upon each side of the vertebræ, noticing any effects which may occur, especially if tender spots are discovered. Anæsthesia or hyperæsthesia may be found, and if so, the coil distance in each case should be recorded. Pain is not necessarily an indication of inflammation, nor of congestion, but these are common causes. When the electrode is passed over bony prominences pain may be felt; even the ribs are sometimes painful under the application, perhaps due to the effect of the current upon the periosteum or intercostal nerves. For testing cutaneous sensibility the wire brush is useful, or an electrode consisting of a bundle of fine, insulated copper wires, contained in a hard-rubber case. In this instance, one electrode is to be placed between the shoulders and the active electrode is placed alternately upon similar points on opposite sides of the body, when any change or difference may be noted. Paræsthesia, or diminution of sensibility, is a common symptom in many lesions of the brain, spinal cord, and peripheral nerves; but in the early stage of neuritis there is hyperæsthesia, which also may occur in hysteria and some reflex neuesros.

In using the galvanic battery for electro-diagnosis, we should have a sufficient number of cells (forty to eighty) to supply the proper potential for all required purposes, and the cells should not be too small for the work. The cells should be connected in series, and not in parallel. They may be connected with a pole-board and current-selector, or the current may pass through a controller, or resistance-coils, and a milliampèremeter, by which the strength of the current may be accurately measured. Where the potential is high, as in the Edison current for electric lighting, it has been claimed that, even though the current may be cut down by introducing resistance, the effects of the current are not identical with those from a battery supplying just sufficient potential for the work. The milliampèremeter may mark the same strength of current, but patients complain of more pain, and this is especially so in electrolysis, for removal of hair, small nævi, etc. As Dr. Walling says, "A painful and sensitive nerve quickly differentiates against voltage." Therefore, "when making a diagnosis, the meter, but not the controller, should be in circuit." De Watteville's method is to place the electrodes in position and commence with ten cells, then adding cell by cell, as needed, to get the reaction desired.

Attention has been already called to the physiological nerve and muscle reactions under galvanism and the reaction of degeneration. The following will show the method of comparing the electrical reactions of the muscles of the arms, one of which is supposed to be paralyzed. Having bared both arms and the chest of the patient, place a large, well-wetted sponge, or other electrode, upon the sternum, connected with the positive pole, and apply the cathode, or small negative electrode, to the motor points of the muscles of the sound arm first and note the reaction, following this by similar applications to the affected limb.

The currents should be only strong enough just to produce contractions in the healthy muscles, and the additional amount necessary to produce contraction in the paralyzed muscles, together with any alteration in the order of the normal formulæ, should be noted. The muscles should also be tested with the faradic current in a similar manner. The patient must allow the limb to be perfectly passive during the examination; if he will not do so, the muscles may be examined after the subject has been etherized. If, however, anodal closing contraction comes before cathodal closing contraction, and several trials confirm the observation, then degeneration may be positively diagnosticated. The relationship of this symptom to various lesions and diseases is set forth in the accompanying table, compiled after Adams, from Erb :—

| ELECTRICAL REACTIONS. | PROMINENT SYMPTOMS. | SEAT OF LESION. | PATHOLOGICAL CONDITIONS AND THEIR LOCATION. |
|---|---|---|---|
| All normal. | Paralysis.<br>No muscular degeneration. | Path of impulse from the brain (antero-lateral columns); or the brain itself. | Lateral sclerosis (idiopathic or from cerebral disease). |
| Nerve: Normal.<br>Muscle: Qualitative and quantitative alterations. (Partial R. D.) | Paralysis.<br>Muscular degeneration. | "Trophic centre" for the muscle, and also the path of impulse from the brain (antero-lateral columns). | Amyotrophic lateral sclerosis. |
| Nerve: At first normal; afterward diminished.<br>Muscle: Qualitative and quantitative alterations. (Partial R. D.) | No paralysis at first.<br>Muscular (afterward nervous) degeneration. | "Trophic centre" extending to multipolar ganglion-cells of the anterior horn of gray matter. | Progressive muscle-atrophy (of central origin).<br>Bulbar paralysis.<br>Mild acute poliomyelitis. |
| Nerve: } Reaction of degeneration.<br>Muscle: } | Paralysis.<br>Atrophy of muscles and nerves. Abolition of reflex actions. | Multipolar ganglion-cells of the anterior horn of gray matter. | Anterior poliomyelitis.<br>Infantile paralysis.<br>Lead poisoning. |
| All normal. | Paralysis.<br>No degeneration. | Motor nerve-fibres. | Light form of rheumatic, traumatic or pressure paralysis. |
| Nerve: Normal.<br>Muscle: Qualitative and quantitative alterations. (Partial R. D.) | Paralysis.<br>Muscular degeneration. | Motor nerve-fibres and path of trophic influence to muscle. | Middle form of ditto. |
| Nerve: } Reaction of degeneration.<br>Muscle: } | Paralysis.<br>Muscular and nervous degeneration. | Motor nerve-fibres, path of trophic influence to muscle, and path of same to nerve. | Severe form of ditto. |
| Normal, or diminution to maximum excitation. | Pseudo-paresis.<br>Simple atrophy. | Muscular fibre. | Muscular wasting in phthisis, etc., and in diseases of the joints.<br>Idiopathic myositis. |

When a lesion is in the cord above the dorsal enlargement, as in some forms of **transverse myelitis**, all the nerve and muscle reactions, according to Dr. Walling,[*] will be normal for the parts below the trophic centre, except that, possibly, there may be some increase in readiness of response to electro-stimulation. If the lesion involve the dorsal enlargement, of course, there would be the reactions of degeneration. If the lesion affect the **basal ganglia** of the brain or the **hemispheres** there will be no change in the normal nerve-muscle formula unless the disease, in its progress, produces changes in the cord, thus also affecting peripheral nerves. In a **hemiplegia resulting from a clot in the corpus striatum**, there will be no change in the reactions, except that in some cases the muscles respond more readily than normal to both currents. In old cases there may be a quantitative decline, due to degenerative changes, both in nerve and muscle. In **uncomplicated lateral sclerosis** the reactions are normal. In **amyotrophic lateral sclerosis** there will be both qualitative and quantitative changes in the muscles or partial reaction of degeneration. In **anterior poliomyelitis, infantile paralysis**, and in **lead-palsy** the reaction of degeneration will be present. It will also be found in **peripheral palsies** of traumatic, rheumatic, neuritic, or diphtheritic origin. It is absent in all **cerebral, hysterical, myelitic,** and **purely myopathic paralyses.**

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[*] *Loc. cit.*

In cases where the reaction of degeneration is limited to a definite, peripheral, neuro-muscular area the probabilities are in favor of the diagnosis of a peripheral lesion. When the degeneration phenomena are observed over a larger area a central (spinal) origin of the paralysis is rendered probable.

In **light forms** of rheumatic, traumatic, or pressure paralyses the reactions will remain normal, but in **severer forms** the reaction of degeneration develop themselves. In **muscular wasting or simple atrophy**, as in phthisis, in diseases of the joints, and in idiopathic myositis, the reactions are normal, or may be quantitatively reduced. When the reaction of degeneration, either complete or partial, occurs, we conclude that an alteration (degenerative atrophy) has taken place, either in the trophic centres or motor fibres going to the affected muscle, although Gessler claims that no such reaction is given unless the muscular structure has also undergone degeneration.

It should be borne in mind that it is the density of the current in the nerve which determines the amount of excitement, and not merely the volume of the current as registered by the milliampèremeter, and that this **density in the nerve** is controlled by the **size** of the active electrode and the **location** of the two **electrodes** (Adams), as well as the current intensity. Attention is no longer given to the **direction** of the current, so that no advantage is gained by placing the two electrodes on the skin along the course of the nerve. The indifferent electrode may be above or below the point of application of the **testing** or **active** electrode, as it is the action of the pole upon the part that is sought and not the direction of the current.

**Clinical Electro-Therapeutics.**—The clinical applications of electricity are partly deduced from the scientific data just given, and partly derived from experience. Although the essential identity of electricity from all sources is insisted upon, it is to be noticed that, under different conditions, and especially when supplied from different sources, the effects depend largely upon the conditions and methods of application. In practice, therefore, it is convenient to speak of electricity from the galvanic battery, the faradic coil, or the static apparatus, as if they were actually different kinds of electrical current. Indeed, it has been found that no one form is applicable to every purpose, and the physician, therefore, requires several forms of apparatus, and it needs some knowledge of the subject and some experience in order to determine which form shall be used. According to Rockwell, in nearly all cases where electricity is called for, each one of the forms—faradism, franklinism, or galvanism—might, at one time or another, possess positive value over the others. This authority gives the following differential indications for the use of dynamic and franklinic, or static, electricity: "Hemiplegia, accompanied by exalted muscular contractility, calls for a mild and rapidly interrupted **faradic current**, if for any form of electricity whatever. Indeed, this current is usually preferable, if the muscular contractions were only somewhat less readily called out than in the normal state. The **galvanic current** is indicated when there is very great diminution of electro-muscular contractility. In most cases of paraplegia, either complete or proximate, loss of farado-muscular contractility exists, at least, for a short time, and the galvanic current alone is applicable. The faradic current might be useful in attempting to improve impaired nutrition of the paralyzed members. The constant (galvanic) current is alone applicable for directly affecting the central nervous system.

"In the great majority of cases of neuralgia, where firm pressure over the affected nerves aggravates the pain, the galvanic current is indicated; if pain is not increased by pressure the faradic current should be used. Hysterical hyperæsthesia calls for the faradic current. While it is impossible, in many diseases, to say that a particular current is indicated to the exclusion of others, it is possible to name a variety of conditions where, as a rule, one method of treatment with one form of current is superior to others. The faradic current is indicated, for its tonic effects, in cases known as general debility. Not much is to be said of individual conditions which seem to demand the faradic current alone." Some few distinct organic or functional diseases in every phase of their manifestation, according to Rockwell, demand a single form of electricity. For instance, asthenopia, accompanied by hyperæsthesia of the retina and ciliary nerves, seems to require the faradic current. It is also useful in the paralysis following diphtheria, in which galvanism is of little service. Galvanism is particularly useful in special irritation or neuralgia, and in certain neuralgic sequelæ of cerebro-spinal meningitis; also, in treatment of exophthalmic goitre and in restoration of sense of taste or smell. It is superior to faradism in the treatment of skin affections. The form of electricity required in chorea varies according to the general condition of the patient: central galvanization in the well-nourished, and general faradization in those whose general nutrition is impaired. The same may be said of amenorrhœa; but in dysmenorrhœa the galvanic current is more frequently indicated.

"Franklinic electricity is less efficacious as a constitutional tonic than general faradization, but is a valuable supplement to the latter. The pain of myalgia (muscular rheumatism) is relieved by Franklinism sooner and more effectually than by other methods, and it acts best when applied by a roller. Franklinism is superior to either galvanism or faradism for relieving pain of a chronic character, confined to no special nerve-trunk or distribution, with no tenderness on pressure over the nerve. It is also most efficacious in treating the enlarged joints of subacute and chronic rheumatism; and in facilitating absorption in synovitis it is best employed in the form of sparks. It is often superior to other forms in old contractions and in cutaneous anæsthesia. It has, however, a far more restricted field than galvanism, and is less convenient than either of the allied forms of electricity."*

**Central Galvanization: Cautions with Regard to its Employment.**—The method of **central galvanization**, as practised by Beard and Rockwell, when supplemented by skillful manipulation, has produced very striking results, but it cannot be considered entirely safe in unskilled hands, and probably should not be attempted by the average operator. "The object of central galvanization," according to the authority just quoted, "is to bring the whole central nervous system,—the brain, sympathetic, and spinal cord,— as well as the pneumogastric and depressor nerves, under the influence of the galvanic current. One pole (usually the negative) is placed at the epigastrium, while the other is passed over the forehead and top of the head, by the inner borders of the sterno-cleido-mastoid muscles, from the mastoid fossa to the sternum, at the nape of the neck, and down the entire length of the spine." The application to the head is made by passing the pole (positive), from one temple to the other, over the forehead, using from two to six cells (about two to five milliampères), or increased until a sour or metallic taste in the mouth is experienced by the patient. The electrode is allowed to rest for a minute or two upon the cranial centre or vertex, because a current passing from this point to the epigastrium traverses the facial-nerve roots and others in the medulla, and also the sympathetic. A labile application or sudden interruption of the current may cause dizziness or mental confusion. During from one to five minutes, the electrode is next passed on both sides, down the neck, as above described, thus affecting the pneumogastric, as well as the ganglia of the sympathetic. A weak current only is permissible here. Proceeding next to the spine, an especial application is made over the cilio-spinal centre, between the first and seventh cervical vertebræ. Although recent observations make it very doubtful if the current actually reaches the spinal cord, there is no question about the effects upon the spinal nerves, and so the cord may be affected indirectly; and the same remark applies to the great sympathetic ganglia. The positive pole is carried the whole length of the spine, the application lasting from three to six minutes. The whole length of the sitting required for central galvanization should not exceed fifteen minutes. The disrobing required is simply, in a male patient, the removal of the coat and waist-coat and loosening of the clothing, so that access can be had to the epigastrium and the spine; and, in female patients, it is necessary to remove the corsets and to loosen the clothing at the neck and waist. The electrodes employed by Drs. Beard and Rockwell were a sponge- or flannel- covered, flat electrode (negative), having an insulated handle, by which it is held to the epigastrium by the patient himself. For the positive pole a flannel-covered electrode is used, having the disk parallel with the handle, so that it can be passed along the spine under the clothing. The battery should be a constant one, and furnished with a rheostat.

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* *Philadelphia Medical Times*, vol. xiii, p. 345.

**Objections to Galvanization of the Sympathetic in the Neck.**—The best authorities speak of galvanization of the cervical sympathetic as a dangerous procedure, on account of the proximity of the pneumogastric nerve. Brown-Séquard remarked that he once tried to galvanize the cervical sympathetic of a friend in order to relieve him of a violent headache. "The effect was all we could desire against the headache, but the galvanic current (acting at the same time on the sympathetic and vagus, the simultaneous action of these two nerves cannot be avoided) produced such dangerous syncope that I would never again attempt to apply galvanism to the cervical sympathetic of man."

The galvanic current differs clinically from the faradic current in having much greater quantity with less tension or difference of potential, and hence produces greater dynamic and physiological effect than the latter, which, owing to very high tension, is apt to cause pain and excite muscular spasm, even with weak currents. It may be continuous or interrupted, and, as it is definite in its direction, it is capable of being reversed. Owing to its large volume or quantity, it penetrates the tissues more deeply.

**The Medico-Legal Value of Electricity in Diagnosis.**—Dr. W. B. Pritchard reports* a case of traumatic neuritis in which electricity proved of much value in aiding the diagnosis. "A man aged 49 received an injury to his shoulder under circumstances which would have entitled him to some compensation if any permanent damage had been done. When the swelling had gone down he complained of great pain in and around the shoulder, and of inability to raise the arm from the side. It could not at the time be determined whether this was due only to the pain, or whether there was loss of muscular power. There were tenderness and pain in the areas supplied by the supra-acromial branch of the cervical plexus and circumflex nerves, and some hyperæsthesia of this region. In the course of the next few months the pain and weakness remained much about the same, and it was then found that the circumflex nerve gave the reaction of degeneration. This set all doubt as to the existence of a traumatic neuritis at rest, and the patient succeeded in obtaining compensation without going into court."

**Special Applications of Electricity in Clinical Medicine.**—Disorders of the locomotive apparatus were probably the first to suggest the employment of electricity in medicine, owing to the fact of the contraction of the healthy muscular fibres when a current is made to traverse them, especially if the position of the electrode correspond with the entrance of the nerve into the muscle or the nerve-trunk itself. Paralysis, therefore, was the first condition to receive electrical treatment, and still is regarded as being especially amenable to the current. Pathological research and clinical observation have finally revealed the varied causes of paralysis, and clearly show the reason why a form of treatment so efficient in some cases is useless, or even injurious, in others. Paralysis of a muscle, or group of muscles, may be due to purely local causes; it may be due to a lesion of the nerve-trunk, or in its fibres of insertion or origin; it may also be due to a disorder of the centre in the brain or cord corresponding to the muscles affected, or to reflex irritation. Occasionally we see it caused by some remote or reflex cause which influences the nerve-centres, as in paralysis following intestinal inflammation, or in the form known as hysterical paralysis. When a morbid condition arises from such diverse cause as in the example just cited, it is very evident that the scientific treatment, which includes removal of the cause where is is possible so to do, would depend upon the diagnosis. The first principle of successful application of electricity, therefore, as already stated, is correct diagnosis, and a clear appreciation of the objects sought to be obtained by the current to be employed, and in some cases a combination of different forms of current will be necessary in order to attain the desired result. If to good diagnostic powers we add familiarity with the effects of electricity and skill in their applications to produce such effects in the living human body, we are in a position to employ this invaluable therapeutic agent with every prospect of success. In the following pages a review of some of the recent and more useful applications of electricity is presented, but for a complete exposition of electro-therapeutics we must refer to the systematic treatises of Beard and Rockwell, de Watteville, Liebig and Rohé, and the numerous monographs by Apostoli, Massey, Adams, Peterson, and others.

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* *New York Medical Journal*, November, 1890.

**Electricity for the Relief of Pain.**—The late Dr. Hutchinson [*] employed the faradic current by preference in **muscular rheumatism,** observing strictly the following precautions: A coil must be used which gives a fine, steady current, *i. e.*, one without jumps or sudden interruptions, and of adjustable force. Only so much ought to be used as produces a distinct vibratory sensation without sharp pain. Before applying the electrode, see that the skin is thoroughly dried and well-powdered with a good conductor, and for this purpose starch is not so good as a mineral substance like powdered clay. The active electrode should be of polished metal,—a ball or rounded tube,—kept dry and warm; the passive may be a small sponge, held in the hand or at any indifferent point. Beginning with a force scarcely felt, slowly increase, keeping the active pole in constant motion over the painful muscles, observing carefully to avoid contracting a single fibre. If muscle contraction be produced no good results. All the force must be expended upon the skin; in other words, upon terminal nerve-filaments, which are alone the seat of pain in this annoying disease. Every inch of skin covering painful parts should be carefully gone over with the current, exercising a steady, slight pressure, for about a half-hour, and applications repeated twice daily until the case is well. It is unusual, he states, for a violent attack to persist more than two days with this treatment. De Watteville also recommends cutaneous faradization, and states that galvano-faradization may, with advantage, be sometimes substituted for it. He also says that the galvanic current may be applied: the current—moderate to strong—is passed for a few minutes, and the sitting concluded with a series of interruptions or voltaic alternatives, so as to excite the muscular tissue to contraction. We have obtained excellent results in pain confined to muscles—**myalgia, lumbago, stiff-neck**—by a resort to static electricity, which affords marked relief to the pain and does not require removal of the clothing.

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[*] *New England Medical Monthly*, September, 1891, p. 622.

The treatment of **articular rheumatism** by electricity is a novelty, and yet Dr. W. F. Robinson, of Albany, N. Y., reports excellent results from it.* Therapeutically, he divided cases of rheumatism into two classes : those in which only one or two joints are affected, which he always treats by means of galvanism; and secondly, those in which the rheumatic poison is more extended in its action, involving joints, muscles, fascia, etc., for which he employs static electricity. The electrodes, he writes, should be large and carefully made. If covered with sponge, this should be soft and free from gritty particles. In order to increase the conductivity of the skin, the sponges should be saturated with a hot solution of bicarbonate of soda. The caustic action and the electrolytic action of the electrical current are to be avoided in the treatment of rheumatism. The action of vital stimulation is to be sought; to obtain it the procedures of interruption and voltaic alternation must be adopted. Voltaic alternation is a still stronger stimulation than interruption, but it must be used with caution, for with strong currents the pain and irritation are very great. Joint-rheumatism, pure and simple, is almost powerless to withstand the direct application of the galvanic current. When the disease is more diffused, and involves various tissues and organs in different parts of the body, static electricity is indicated. The general charge is rarely used alone, and static electricity is usually given, by means of special electrodes, in the form of sparks. The applications may be made on alternate days. The usual length of the treatment is ten minutes, for about five of which sparks are drawn, the patient during the remaining five minutes simply sitting quietly upon the platform and taking the general charge.

Dr. Robinson states that electricity has a twofold action that meets all the indications of rheumatism: a specific action against the morbid process, and a general tonic action that tends to build up the system depressed as a result of the disease. Dr. Goelet, at the same meeting, stated that the sedative effects of galvanism could best be had by currents of short duration. He prefers a clay electrode, made of the consistency of putty, and maintains it so by keeping it moist. A flat pad is made by rolling it on boards, as if it were dough; it is gotten into shape, and, after having a metallic plate placed on the back, is covered with a layer of absorbent cotton, and is then sewed up in a gauze cover. On the back is placed rubber cloth, just as in sponge-covered hand-electrodes. To avoid the discomfort of a cold application, the electrode may be kept on a warming-pan, consisting of a flat tin or zinc jug filled with hot water. Dr. M. A. Cleaves also reported cases in which marked benefit followed the use of the galvanic current in **articular inflammatory exudations.** Stabile applications, of ten milliampères strength, for fifteen minutes, with the anode at the sternum and the cathode applied over the affected joint, were followed by relief from pain, diminution of heat, and increased mobility. The current was used daily for a weak, and then every two or three days, until thirteen *séances* were given, when faradism was applied to the muscles around the joint, with the cathode at the sternum and the anode applied successively to the motor points of the various muscles.

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* Proceedings American Electro-Therapeutic Association, First Annual Meeting, Philadelphia, 1891. *Medical News* reprint.

The ultimate result was decided and satisfactory. Ankylosis, the result of chronic inflammatory processes, even with some osseous union, according to Dr. von Raitz, of New York, yields to the constant current, with the assistance of massage and passive motion. The various forms of **neuralgia** are amenable to electrical applications—in all cases for amelioration, in most cases for cure—in proportion as they are pure neuroses, and not the result of decided structural change. Electricity, says Dujardin-Beaumetz, is one of the most active agents in the treatment of rebellious neuralgias. Galvanic currents are preferred to faradic. The negative pole is applied near the nerve-centre; the positive pole (which is the truly sedative pole) may be moved over the different painful points of the affected nerves. In **tic douloureux** the currents should be very mild,—not to exceed three to four milliampères. In sciatica much stronger currents are required (twenty or more milliampères). He agrees with Apostoli, in holding that the stabile applications should be continued until the pain disappears or some mitigation is observed. Duchenne preferred the use of faradism,—applying the wire brush over the affected area, and employing a very strong current with rapid interruptions. Electro-puncture, as practised by Magendie, is no longer used.

**Electric Cataphoresis,** as it is called, by means of which medicaments are carried through the skin under the action of electrical currents, is a new and valuable addition to our resources in the treatment of neuralgia. As shown some years ago by Adamkiewicz, the wetting of the active electrode with chloroform leads to its local absorption. In the place of chloroform, we now use cocaine solution (10 to 20 per cent.). Aconitine may be substituted, or any soluble alkaloid. Anodic electrolysis in conjunction with cocaine cataphoresis, says Adams, gives great relief in neuralgias and other painful affections. If a considerable quantity of medicament is sought to be introduced, we may have the electrode in the form of a tube closed at one end with a porous partition (Du Bois-Reymond's conducting tube, stopped with a plug of clay), and since, according to Munk, the current should be occasionally reversed, it is necessary to have both electrodes charged with the substance used. Dr. Arthur Harries[*] prefers cocaine cataphoresis to hypodermic injections. He employs a large negative electrode wet with a salt solution, and the positive is small, covered with flannel, and wet with a 10-per-cent. cocaine solution. A continuous current of twenty-five milliampères is then passed for forty minutes, the electrodes being kept moistened with the solutions. Peterson[†] claims that "the anæsthesia produced by a 10- to 20-per-cent. solution of cocaine on the anode is sufficient for small operations, and affords distinct relief for from four to eleven hours in cases of severe neuralgia in superficial nerves." His method of securing accuracy of dosage, which is as follows, is ingenious: "It is necessary to use a flat, metal electrode, made preferably, but not necessarily, of platinum or tin. It may be of any convenient size and shape. A piece of filtering-paper or linen is cut to fit over the metal surface; this is soaked with a definite quantity of the solution to be used, and the electrode is then applied to the skin. A narrow soft-rubber rim at the edge of the electrode prevents any loss by evaporation. In order to have drugs ready for use at any time, disks of paper to fit the electrode may be charged with aqueous or alcoholic solutions and then allowed to dry, a drop or two of menstruum being added when they are to be used. The strength of current is regulated largely by the patient's feelings, but from five to twenty milliampères, or from ten to thirty cells may be used for five to fifteen minutes. The stronger the current, the shorter the duration of the sitting. The indications are: (1) To produce local anæsthesia for neuralgia, superficial pains, and cutaneous operations, a 10- to 20-per-cent. cocaine solution is used. Aconitine produces a deep analgesia, but it is accompanied by severe smarting around the edges of the anæsthetized area. Three or four drops of a 1-per-cent. solution of helleborin cause a deeper and more lasting anæsthesia than cocaine, without producing constitutional effects. Both ouabaïn and strophanthin, in doses of $\frac{1}{250}$ grain or more, are strong local anæsthetics. One or two drops of chloroform bring about a deep analgesia in a short time, but this is followed later by vesication. A mild solution of carbolic acid may also be employed as a local anæsthetic and analgesic. (2) For topical medication in various local lesions,—such as tumors, rheumatic, gouty, and other swellings; various skin diseases, syphilides, etc. In these cases iodine preparations, lithium, and mercuric salts may be used. (3) To induce absorption of medicines from baths. (4) For diagnostic purposes. Thus, if a pain were complained of in the region supplied by the trigeminus nerve, it should disappear under this treatment; if it did not, the lesion could be localized farther back, or it might lead to the conclusion that it was a hysterical pain."

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[*] *Lancet*, October 25, 1890.

[†] *Medical Record*, January 31, 1891.

In a communication to the American Electro-Therapeutic Association last year, Peterson stated that special forms of electrodes are no longer considered necessary, since ordinary sponge-covered electrodes will answer for solutions where accuracy is not specially required, and metallic ones for the more careful administration. The latter are supplied with a narrow rim of rubber to prevent evaporation, and a disk of cotton cloth, tissue- or blotting-paper may be cut to fit the surface, and upon this the desired number of drops of the drug in solution can be placed. Disks of filtering-paper containing a known quantity of the remedy may be kept on hand for this purpose. Cocaine employed in this way does not cure neuralgias. All that is claimed for it is that it affords relief without producing constitutional effects, and is, therefore, superior to any narcotic given internally. Where the cause of the neuralgia is deep-seated the improvement is much less evident than when the lesion resides in a superficial nerve, and Dr. Allen Starr calls attention to this valuable hint in diagnosis, as regards the question of surgical operation. If the pain be relieved temporarily by the treatment, the lesion is in the immediate neighborhood or peripheral to the anæsthetized area, and this would suggest the possibility of permanent cure by neurectomy or nerve-stretching. Dr. Fouveau de Courmelles, of Paris, presented a paper at this meeting of the Electro-Therapeutic Association, in which he stated that the pain of hepatic or renal colic may also be made to disappear by medicamental electrolysis or cataphoresis.

In various forms of neuralgia relief may be afforded from the action of galvanism by anodal diffusion over the painful spots. In no painful affection, says Bartholow, is the application of electricity more conspicuous for good than in **sciatica.** Large sponge-electrodes, moistened with hot water, are applied, both—labile and stabile—over the course of distribution of the nerve, using currents of twenty to forty milliampères. The applications should be made twice a day, if possible, or at least once daily. **Intercostal neuralgia** and **herpes zoster** also yield to galvanism, using small electrodes, applying one (usually the cathode) to the spine and the other to the distribution of the nerve in front; or, to place the anode over the painful points where the nerves become superficial, and the cathode on the terminals.

In **migraine,** in addition to the administration of remedies directed to the stomach, we apply galvanism, in the same manner as just indicated, to the supra-orbital nerve distribution. Galvanization of the sympathetic in the neck and of the pneumogastric, as practised by Du Bois-Reymond, can only safely be practised by an expert. Faradism, with very rapid interruptions and mild currents, may be used, in conjunction with gentle massage (the electric hand). In nervous vomiting, and especially the vomiting of pregnancy, a descending current of voltaic electricity exerts a remarkable remedial effect, the positive pole being applied above the clavicle and the negative to the pit of the stomach.

In **angina pectoris,** Eulenberg reports good results from galvanism administered in the intervals between the attacks.

Various forms of **visceral neuralgia** are amenable to galvanism. The applications may be entirely to the surface of the body, or one electrode may be introduced into the stomach, rectum, or vagina. Faradic electricity may also be used; mild currents and frequent interruptions for the sedative effects, and the electric brush, with stronger currents, to the skin as a counter-irritant.

In **gall-stone colic** with impaction, good results have been obtained by passing brief currents of high intensity, the electrodes being placed in the hypochondriac regions. The electrical stimulus produces contraction of the fibres entering into the common duct, and the consequence is that the stone is discharged into the intestine.

**The Static Current in Neuralgia—Morton's Method.**—For pain not accompanied by evidences of acute inflammation, perhaps no form of application can equal franklinism. Indeed, Adams states that "In all vaso-motor disturbances, functional cerebro-spinal diseases, or neuroses, there is nothing, in the author's experience, which equals in value the diffused and the concentrated constant high potential currents from electro-static induction machines." As already explained, the diffused constant current or electro-static bath is where the patient is placed upon an insulated platform and charged with the current. The concentrated constant current is obtained by bringing an electrode near to any desired spot upon the surface, and thus drawing a shower of sparks from this locality. In the former case the circuit is completed at all parts of the body through the air, and in the latter by means of the spray coming from or going to a pointed metallic electrode which is in connection with the ground. By an ingenious device of Dr. W. J. Morton, of New York, contained in a peculiar-shaped instrument named, in consequence, the "pistol electrode," the current is tapped in the rheophore, and the electrodes may be placed directly in contact with the patient's body, just as in the application of the faradic current. In using this method of Morton, as practised by Bartholow, one brass chain is fastened to the top brass knob of one condenser (the left one being the higher potential), and another brass chain is placed around the base, over the metallic coating of the other condenser, and to each chain an ordinary electrode (preferably a carbon electrode), covered with leather, is attached. The discharging rods are placed at a distance apart, which is determined by the effect to be accomplished, which consists in the faintest tingling when the rods are nearly together, or the most powerful muscular contractions when they are some distance apart. The same kind of irritation of the sensory nerves is caused by this interrupted current as that caused by the faradic; but it is softer. The most powerful muscular contractions can be produced without causing pain; and in this respect static electricity possesses distinct advantages over faradic. The interrupting handle of Morton is dispensed with in Bartholow's method; indeed, no special electrodes are required, and only as much of the current is taken as is desired.

Either electrization by sparks or by the Morton method may be employed in advantage in trifacial, intercostal, sciatic, and other neuralgias. General franklinization is especially useful in **hystero-epilepsy**.

Dr. S. H. Monell regards static electricity as surpassing any other agent in the management of hysterical conditions. He esteems it of superior value also in combating nausea, dyspepsia, constipation and colic. In chlorosis and anæmia it improves nutrition. It is an efficient cardiac tonic in both functional and organic disease of that organ. This writer asserts that franklinism is the most powerful means at our command for relieving the pain of locomotor ataxia and that, used in conjunction with galvanism, it may indefinitely arrest the progress of early cases. In all forms of motor paralysis it has given excellent results. Static electricity is of decided service in chorea and in epilepsy it moderates the frequency and severity of paroxysms. In exophthalmic goitre, gout, rheumatism and lateral curvature of the spine this form of force is of benefit. It is of service also in chronic inflammatory affections.

Imbert de la Touche, of Lyons, concludes that obesity of nervous origin and the fatty anæmia common in neurasthenia are beneficially influenced by electricity, and that the static electric bath is the preferable mode of application.

**Anæsthesia** is very commonly functional and often a manifestation of hysteria. In such cases the anæsthetic area will, under a few applications of the faradic brush, rapidly recover its tactile sense. When the loss of sensation is due to inflammation, compression, traumatism, or other lesion, except actual loss of continuity of nerve-fibres, it will, as a rule, also be soon restored by electricity. When the galvanic current is employed the anode should be over the nerve-root and the cathode over the anæsthetic area, or the galvanic brush or faradic brush may be used. In **trigeminal anæsthesia**, Liebig and Rohé indorse transverse brain-galvanization; galvanization of the trunk and branches of the fifth nerve; the faradic brush to the anæsthetic surface, or to a small area of the forearm, as recommended by Vulpian. **Hemianæsthesia,** due to central or toxic causes, very frequently yields to the application of the faradic brush according to Vulpian's method. **Tabetic** and **traumatic anæsthesia** may be relieved, but not fully restored, unless the nerve-trunks can be made to resume a normal condition. **Anosmia**, or loss of the sense of smell, if not depending upon disease of mucous membrane, may be cured by faradization. In weakness of vision, amblyopia, amaurosis, **anæmia of optic disk**, and especially in tobacco-amaurosis (scotoma), electricity is of great value, the applications being made through moist compresses applied to the closed eyes,—the anode locally, and the cathode to the temple or the cheek. The strength of the current should not be greater than just enough to cause faint flashes of light, and the *séances* should last only a few minutes. Galvanism should also be directed to the cervical sympathetic and to the cilio-spinal region of the spinal cord. In anæsthesia of the auditory nerves, and in tinnitus aurium, Brenner, Erb, and others have conclusively proved the value of the polar method. The canal is filled with warm water; a special electrode may be used, or the ordinary small electrode may be dipped into the water and inserted into the ear. By the judicious use of this expedient, tinnitus aurium has been stopped after it had existed for years. In some cases, very marked improvement was noticed after the first application or after a few applications.

**Electricity in the Treatment of Paralysis.**—The favorable influence exerted by electricity over nutritive processes and cell-growth, especially in the form of galvanism, has made it the indispensable remedy in the treatment of various forms of paralysis, whether due primarily to nerve or to muscle. It is not judicious, in **hemiplegia,** to employ the electrical current too early, on account of the lesion in the brain; but after the first shock of the brain-injury is over, whether an extravasation or an embolus, and the parts are accommodating themselves to the condition and repair is going on, in a week or two after the attack came on, the electrical current may be used to keep up the nutrition of the muscles, employing both galvanic reversals and the faradic interrupted or labile applications. The precaution should be observed of only using a current strong enough to produce moderate contractions, and not continued very long (fifteen to twenty minutes for the entire *séance*). In various forms of **monoplegia** and paralysis of individual muscles, galvanization may show the reaction of degeneration due to local nerve or muscle changes; but the systematic application of galvanism, at first stabile, followed by a few current reversals, and the faradic brush or static breeze or sparks, will cause the normal formula to be restored. Hygienic remedies must not be neglected, including massage, baths, and passive exercise. In **diphtheritic paralysis,** or **paralysis following typhoid** or other **exhausting** diseases, brain and spinal galvanization, with direct applications of both faradism and galvanism, should be resorted to. Static electricity is also useful here. In **lead-palsy, mercurial paralysis,** and similar toxic paralysis, the galvanic current may be applied to the affected groups of muscles, and the faradic to their opponents. **Paralysis of the laryngeal muscles**

may be treated by intra-laryngeal applications of galvanism or faradism, with special electrodes, as practised by Elsberg or by von Ziemssen. Equally good results, it is claimed, may be obtained by the method of Erb, in which the anode is placed under the occiput at the root of the neck, and the cathode applied to the front of the neck along the larynx and trachea. Faradism may be applied in the same way, but weak currents only should be used.

In paralysis dependent upon chronic poliomyelitis, Hammond has reported several cases which seem to show that persistent daily use of galvanism may measurably restore the function of muscles which, at the first examination, exhibited no visible reaction.

In **aphonia of hysterical origin,** the faradic brush or the static spark is promptly curative. In paresis accompanying neuritis and perineuritis, galvanism (anodic) is very useful, and farado-massage applied when the acute stage is over.

In **facial paralysis** due to inflammation in the course of the portio dura, the prognosis depends upon the extent of the lesion and its duration. In slight cases, the muscles may recover without any treatment; but this result will be attained much more rapidly under mild faradization. Where the reaction of degeneration is present, the patience of the operator and subject may be put under a considerable strain; but galvanism (cathodic) with current reversals and the faradic brush will, in most cases, bring about a cure in the course of time. If the diagnosis be made at the beginning and announced to the patient, it may save later disappointment on account of the apparent want of results from the treatment. **Facial paralysis of central origin** is more serious in its prognosis than the peripheral form. Recoveries are comparatively rare, but improvement may be expected from systematic electrical treatment; with galvanization to the head and neck, and polar applications to the affected muscles.

**Spasms and contractures** call for the sedative applications of the galvanic and faradic currents. Anodic applications in cases of **blepharospasm, convulsive tic, histrionic spasm, contractures following rheumatism,** are sometimes very successful; in others, complete failures. In the latter, the spasm may be due to some source of reflex irritation, such as latent hypermetropia, or myopia, dental caries, etc., which should receive attention before attempting treatment by electricity. In **hysterical spasms and contractures,** the faradic brush or static sparks are useful, especially if disagreeably painful. Spasm of muscles of deglutition may be due to a wisdom-tooth which is about erupting, and incision of the overlying gum will relieve it, perhaps assisted by a few applications of galvanism. **Hystero-epileptic** attacks may sometimes be broken up with the faradic brush or strong galvanic current. In **epilepsy,** Erb recommends diagonal followed by longitudinal brain galvanization to affect the motor area in the cortex; then subaural and spinal galvanization, limited to the cervical region, and general faradization for their reflex effects. This is to be practised between the attacks, in combination with the usual remedial and hygienic treatment.

In **writers' cramp** and other forms of co-ordination neuroses, excellent results are afforded by rest and electro-massage. Erb lays down the rule that the entire cerebro-spinal nervous system should be subjected to systematic electrization. First galvanization of brain and spine, then of the peripheral nerves. Faradization of the affected muscles is combined with massage. By the method of Wolff, in which this is systematically practised, a number of cures have been reported.

In **tetany**, galvanization of the spine and peripheral nerve-trunks and the anodal applications to the spine (Erb) have given good results. In **tetanus** proper, which is an infectious disease, not much can be gained by electricity, although spinal galvanization, with galvanization of the peripheral muscles, is said to have had a good effect upon the spasms. **Chorea** is benefited by weak currents, or by general franklinization or faradization. **Athetosis** is said to have been improved by brain, subaural and central galvanization, with currents from the spinal cord to the peripheral muscles (Liebig and Rohé).

**Explanation of Production of Degeneration-Reaction Phenomena.**—When discussing, on a previous page, the question of electro-diagnosis in paralysis, it was stated that there are important alterations in the electrical reactions. If a muscle be paralyzed by sectioning its motor nerve, or by the use of certain toxic agents which affect the nerve only and leave the muscular fibres healthy, we have a marked difference manifested in the behavior of the muscle under the electrical stimulus. For instance, instead of promptly contracting to the faradic current, we may find no response whatever when this (secondary or induced) current is used. With the galvanic battery, weak currents produce responsive contractions greater than in health, on making and breaking the circuit, or on reversing the current. With a stronger current, the muscle remains in a tetanic state of contraction while the current is passing, which is an abnormal phenomenon. Later, pathological changes occur, both in the nerve and in the muscle, due to removal of the influence from the trophic centres in the cord. When the lesion is destructive and irremediable, there is a gradual failure of galvanic as well as of faradic excitability of the nerve, ending in entire disappearance of the same in a few days. Before this is complete we have the following "degeneration-reaction":—

$$An\ Cl\ C > Ca\ Cl\ C > An\ O\ C > Ca\ O\ C.$$

This is well illustrated in a case of peripheral form of Bell's palsy, while the central or cerebral form of facial paralysis does not present this reaction.

**Electro-Diagnosis in Paralysis.**—We may summarize with advantage the results of the electrical examinations in cases of paralysis:—

**Normal electrical reactions** accompany diseases of the brain or spinal cord (white columns).

**Abnormal electrical reactions**, differing quantitatively from the physiological standard, usually accompany lesions of the gray matter of the cord or the peripheral nerve-trunks. The character and extent of the lesion may be judged by the promptness of response to the electrical current and by the presence of the reaction of degeneration.

**Increased electrical reactions** may accompany general hyperæsthesia of the nervous system, and, if accompanied by reflex contractions of muscles in remote parts of the body, it suggests increase of spinal excitability, such as occurs in strychnine-poisoning, tetanus, hydrophobia, and other forms of disease. Should this phenomenon be restricted to a single muscle, or group of muscles supplied by a single nerve-trunk, the lesion is probably located in the afferent nerve. Dr. Haynes* sums up the diagnostic points in paralysis arising from disease of the gray matter of the cord as follows :—

"When the abnormal reactions are uniform, extending over an entire limb, the disease occupies a mass of its substance, as in the inflammation of the substance of the cord (**myelitis**).

"If they are confined to certain physiological groups of muscles the disease has generally been chronic and implicates the anterior roots of the spinal nerves, as in **progressive muscular atrophy**.

"If the degenerate muscles react in an irregular manner, neither according to distribution nor function, the disease has usually been the result of an acute inflammation of the anterior cornua, which has destroyed some of the nutritive centres and left others intact (**poliomyelitis anterior**).

"When a nerve is found deficient in response, and muscle normal, it shows alteration in the former, the latter remaining intact, as is sometimes seen in the early stage of **infantile paralysis**.

"The electrical reactions in peripheral paralysis indicate with exactitude the extent and distribution of the disease.

"When the electrical reactions are normal it indicates a paralysis of slight and temporary form; prognosis is favorable.

"Loss of response when either current is applied to nerve-trunks points to nerve-alteration, and this is in proportion to diminution of action.

"Loss of response to faradism, applied directly to a muscle, indicates changes in the intra-muscular nerves without necessary alteration of the fibres themselves.

"Loss of response with galvanism applied to the muscles shows a modification or destruction of the muscular tissue, and this in proportion to the physical changes induced."

The indications for the different forms of current are also well summarized by the same author :—

"Galvanism is indicated in those cases in which we wish to excite the nerves of the skin, to destroy the outer skin or mucous membrane, to produce an increase of warmth, to produce a chemical process, and also blood-coagulation.

"In certain peripheric palsies in which faradism fails, galvanism, probably in consequence of its uninterrupted duration, produces effects which cannot be brought about by the necessarily rapidly-interrupted faradic current.

"When a muscle has lost all power of responding to the stimulus of a faradic current, in many cases its sensitiveness may be restored by the application of a tolerably strong galvanic current.

"Faradism is indicated where we wish to excite either the motor or sensory nerves, to produce contractions of the blood- or lymphatic-vessels, to effect certain organs supplied by the sympathetic nerve. To increase the volume of a muscle: This it accomplishes through exciting muscular contraction, which increases the temperature and at the same time improves the nutrition. To relax a tense muscle, or to loosen a peripheric contractor, single shocks from a strong faradic current are generally more useful than the galvanic.

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* "Electro-Therapeutics." C. M. Haynes, M.D., Chicago.

"Galvanism not only acts as a powerful stimulant to nerves and muscles when interrupted, but during the time it is passing without interrution it produces a marked alteration in the nutrition. To this effect Remak gave the name 'catalytic action.'"

When paralyzed muscles exhibit the reaction of degeneration they are more sensitive to galvanism than faradism; therefore, the former should be selected to improve their nutrition. With this exception, faradism is a more powerful agent in the direct treatment of paralyzed muscles than galvanism.

According to Dr. Rockwell, in paralysis of one side of the body, or **hemiplegia**, when the muscles contract more readily under the influence of electricity than in health, electricity, if used at all, should be in the form of a very mild **faradic** current; even though the muscular contractions are not excited quite so readily as in a normal condition, the faradic is still to be preferred. On the contrary, when the contractility of the muscles is very greatly diminished, the **galvanic** current is indicated, the faradic current being only employed after the muscles begin to contract under its influence. In most cases of paralysis of the lower half of the body, or **paraplegia**, there will be found, after a short time, more or less complete loss of farado-muscular contractility; the galvanic current alone is useful in these cases to restore nerve-excitability, although the faradic may be usefully employed to improve the impaired nutrition of the paralyzed members.

**Paresis**, or a condition of partial paralysis, is frequently materially benefited by electricity, both galvanism and induced currents being employed. Here we may again caution against the use of too strong currents and too prolonged administration. The contractions of the affected muscles should be slowly produced, so as not to fatigue the muscle or cause discomfort to the patient. In **constipation** owing to defective peristalsis, often due to a paretic condition of the muscular tissue in the intestinal wall, very prompt effects can be obtained by either faradism or galvanism. In using the former a sponge-covered electrode, well moistened, is placed over some indifferent point upon the surface, or it may be held in one hand; the other (similarly prepared) electrode is passed around the abdomen in the direction of the large bowel, commencing at the right side, just over the cæcum, and gradually following the ascending, transverse, and decending colon to the sigmoid flexure. This may be accompanied by kneading the abdomen, or percussion (abdominal massage). For the application of galvanism an olive-shaped electrode may be passed into the rectum, the other being placed on the surface of the abdomen, in the form of a flat sponge. A moderately weak current, not strong enough to cause burning or other disagreeable sensation to the patient, is now passed, and the current broken and reversed several times a minute. If the constipation be simply due to inertia or paresis the effect will be prompt, pleasant, and highly satisfactory to both patient and physician. The treatment of **enlarged prostate** is conducted in much the same manner, with a specially-constructed electrode introduced into the rectum. When the middle lobe is especially implicated, we may obtain very satisfactory results from the use of an insulated electrode introduced into the urethra. In the treatment of **Graves's disease** "Cardew (*Lancet*, July 4, 1891) advises* a galvanic current, two to three milliampères, to be applied three times a day, six minutes to be taken in each application. The anode should be placed at the nape of the neck; the cathode should be moved from the mastoid process along the course of the great nerves. The electrodes are flexible metal, covered with wash-leather, three and a half inches in diameter for the anode, and one and a half inches in diameter for the cathode, Four Leclanché cells or three bichromate cells will suffice. Six Scholl's chloride-of-silver cells (dry) will be enough, and can be used by the patient in his home. The following directions are given: Thoroughly moisten the electrodes with warm water. Apply the anode to the nape of the neck, making firm pressure; apply the cathode to the mastoid, and move it up and down slowly along the sterno-cleido muscle. Each application should last six minutes. Instructions can be written out for the patients, and they can apply the current at home. The author has used this means of treatment in a large number of cases, and believes it to be of great benefit in the vast majority of cases of Graves's disease. He has had failures, but it has been successful where other means have failed."

**Electricity in Gynæcology—The Apostoli Method.**—The convenience, cleanliness, and efficiency of electricity have combined to make it an indispensable adjunct to other therapeutic measures in various uterine and pelvic disorders, and, indeed, in some it has proved to be **the** remedy **par excellence**. In the reaction from the ultra-mechanical measures of a preceding generation and the ultra-surgical tendency of the present, thoughtful physicians have welcomed the treatment of many diseases of the uterus and adnexa which was introduced and practised with such brilliant results by M. Georges Apostoli, of Paris. He first directed the attention of the profession to the treatment of endometritis by the use of galvanic currents of a strength previously unheard of in medical annals. By means of what he termed the "chemical, galvano-caustic current," of from one hundred to three hundred milliampères, he succeeded in checking hæmorrhage, relieving pain, removing chronic inflammatory products, producing involution and restoring normal function and condition. The method can best be explained in discussing its therapeutical applications. The principal peculiarities of this method have already been alluded to, and they are well illustrated in the following brief statement of its applications:—

In **endometritis** attended by much hæmorrhage or other discharge, Apostoli uses a metallic sound insulated, except at its termination in the uterus, by a celluloid sheath or cannula. The active portion of the electrode is of platinum or of gold, so that it will not be corroded by the decomposing fluid when used for the positive pole. Dr. A. H. Goelet, of New York, has devised a set of graduated, interchangeable, non-corrosive steel tips for this purpose, which are durable and comparatively cheap. Dr. Walling has used gas-carbon tips, which are easily replaced if broken; they are made from the carbon points (such as are used in the ordinary arc lights), and are affixed to a stout copper wire, which may be insulated with rubber varnish or by melted shellac. Dr. Andrew F. Currier, of New York, employs vaginal and uterine electrodes of aluminum with a cylindrical, removable tip of platinum, the shaft being covered with thin rubber tubing. These possess the advantage of lightness, flexibility, and comparative cheapness. The second electrode of Apostoli is a large flat surface of moist clay, which admits of accurate moulding to the abdominal wall. If it is not snugly fitted, under the effects of high currents it may cause pain and even blistering of the skin. The objections to Apostoli's clay electrode are, that it is heavy, awkward to handle, and dirty. This may be obviated to some extent by the plan of Dr. Goelet, of New York, in which the clay is made into the consistence of putty and rolled flat; it is then enveloped in a layer of absorbent cotton and covered with linen crash; finally, a sheet of rubber cloth is fastened to the back, by means of which it may be handled and the patient's clothing kept dry. The metal contact plate is pressed into the clay underneath the cotton, and a binding-post extends through the back, by which the apparatus may be connected with the appropriate cord. Another device for the same purpose has been adopted by Dr. Franklin H. Martin, of Chicago, and it consists of a concave, metallic, nickel-plated electrode, the lower surface of which is a sheet of membrane surrounded by an insulated rim to prevent the plate from coming in contact with the skin. When used, about a pint of warm water is poured into the interior through a central opening in the plate, which is then closed with a screw-cap. The transudation of the water through the membrane produces a moist surface for contact with the abdominal wall. This apparatus is cleanly, and it is claimed by Dr. Martin to be capable of transmitting very heavy currents without pain or local action upon the skin. The strength of current employed by Apostoli should not be maintained long,—the duration will depend upon the character of the case; usually it lasts from three to ten minutes, and not repeated oftener than once a week or every ten days. For several days after the application more or less sanguinolent and serous discharge may occur from the uterus, but unless antiseptic precautions have been neglected fever is not likely to be manifest. The number of sittings required for a cure will vary very greatly according to the chronicity and condition of the case.

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* *The University Medical Magazine*, September 1, 1891.

**Hæmorrhages from the Uterus.**—Apostoli calls the positive electrode "the hæmostatic pole," and in persistent hæmorrhages he employs positive electrization by the intra-uterine sound, the negative being connected with the abdominal large plate electrode. Dr. G. Betton Massey reports several cases in which currents of from forty to fifty milliampères were curative in a few applications. When heavier currents are used, he advises having two flat electrodes, one on the abdomen and one at the back of the patient, both connected with the same electrode, thus very much reducing the liability to production of pain. The applications may be made every two or three days. There is, probably, no agent of the Materia Medica which will check hæmorrhage so effectively and promptly as the positive pole; and it is far preferable to the ordinary mineral or vegetable astringents or styptics. Even in cases of myoma or cancer, the effects of the positive pole have been highly successful, while in ordinary menorrhagia, due to pathological conditions of the mucosa, it is curative after a few applications, both of the hæmorrhages and the **chronic leucorrhœa.** In such cases, swelling currents to two hundred or two hundred and fifty milliampères are employed.

For the relief of a **painful condition of the uterus or ovaries** the positive pole is used as above, but the current need not be more than twenty to thirty milliampères, rarely as high as fifty milliampères. The applications, however, should be more frequently made,—every day at first,—*séances* lasting from five to eight minutes. In some cases, this expedient will gain time and afford temporary relief while the patient is being prepared for surgical operation. On the other hand, if an operation has been performed and the ovaries removed, pain may still persist, and here electricity will meet the indication better than any other resource.

**Uterine Cancer Treated by Electricity.**—The good effects Apostoli had in the treatment of myomata with electricity led Dr. Wernitz,* of Odessa, to use it in carcinoma of the uterus. He reports four cases of carcinoma of the uterus in which he employed the galvanic current. The results he reports are the following:—

1. Complete cessation of pain. Patients who could only be eased with strong narcotic remedies enjoyed, after a few applications, complete freedom of pain, good appetite and sound sleep, in consequence of which their general condition improved.

2. The discharges were decidedly reduced in quantity and hæmorrhage ceased.

Whether a complete cure or cessation of the cancerous processes could be expected after a long-continued application of the galvanic current, Dr. Wernitz does not venture to state. The favorable results so far gained by electricity he ascribes to the chemical and electrolytic action of the current.

**Sterility** may result from many causes. If it result simply from imperfect development or defective nourishment of the uterus and ovaries, or to catarrhal endometritis, electricity is of decided value. In the former case, faradism, systematically applied, twice or three times a week in the intermenstrual periods, will stimulate development, and, in the latter, galvanic currents of mild strength will remove the cause.

**Dysmenorrhœa** may also be caused by defective development, and faradism systematically applied will afford marked relief. Where mechanical causes exist, the discovery of their nature may suggest other expedients, but the intra-uterine negative electrode, with weak galvanic currents, will produce excellent results as regards the relief from pain and discomfort. **Inflammatory exudation,** the result of peritonitis, may incarcerate the uterus and ovaries and make them immovable. This is capable of amelioration, or cure, through absorption of the exudate, according to the Apostoli method. In **subinvolution,** which may be attended by pain, sterility, and menstrual disorder, or hæmorrhage, faradism is very useful, but weak galvanic currents (twenty to thirty milliampères) will materially assist in restoring the organ to a normal condition. In all cases of hypersecretion from the uterine mucous membrane, the positive galvanic pole is promptly efficient in overcoming this condition.

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* *Berliner klinische Wochenschrift,* September 22, 1890.

It is, however, in **uterine myoma** (or **leio-myoma**), **myo-fibroma**, and **fibroma**, that the Apostoli method comes in direct opposition to the practice and teachings of the surgical gynæcologist. It certainly should be borne in mind, throughout the discussion of the therapeutics of this form of neoplasm, that its life-history is not well known. The original cause of the growths has not been discovered; they may remain for years of about the same size and then suddenly take on renewed growth, or they may undergo involution and become the seat of degenerative changes. In many cases, especially if small, they may cause but little discomfort, and may be quite accidentally discovered during life or post-mortem; in others they are, without reference to their size or number, accompanied by congestion, hæmorrhage, and various symptoms of disorder calling for relief. The submucous variety tends to become polypoid, and readily admits of detection and removal; the intra-mural and subperitoneal forms, on the contrary, are less easily recognized, and require a more serious operation for their relief. These growths are now scientifically treated by the method of Apostoli, which has the indorsement of some of the best authorities, such as Sir Spencer Wells, Keith, and many others equally well known as competent to decide upon the relative merits of electricity and laparotomy.* A very temperate summing up of the present subject of controversy may be given in the words of Massey:—

1. A properly-conducted electrical treatment of solid fibroids is harmless, will remove the irritation and pain due to their presence, arrest further growth, and almost invariably cause a gradual diminution in their size.
2. Bleeding fibroids may be entirely cured of the hæmorrhagic tendency and pain, arrested in growth and gradually lessened in size.
3. It is possible for the diminution in the size of the tumor to end only in its complete disappearance.
4. In small intra-mural fibroids surrounded by unimpaired uterine tissue, the current applications tend to promote their disengagement from the uterine stroma and extension either into the uterine or peritoneal cavity. In the former case a complete cure may result by delivery of the tumor, and in the latter case a lessening of its symptomatic importance.
5. The time necessary for a satisfactory shrinkage should not be too sparingly measured with the slow cases. Quick symptomatic cure and slow shrinkage are often associated in the same case.
6. In fibroid tumors that have undergone cystic degeneration a treatment by strong currents may do harm, being apt to set up changes in the liquid contents of the cavities that may result in septicæmia.

A uniform result in Massey's experience is, that the first two or three applications, even if strong ones, do not usually cause an appreciable diminution in the size of the tumor, but a striking and almost inevitable consequence is a prompt disappearance of any tenderness about the mass. If this does not occur, it will be found, as pointed out by Apostoli, that some pronounced disease of the appendages co-exists. Fetid or too abundant leucorrhœa is promptly relieved after a few applications. There is also a marked improvement in the general physical health of the patients under this treatment; the abdominal walls increase in adipose, the appetite and digestion improve, the bowels become more regular, and the chronic invalid finds himself restored to health and usefulness.

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* Additional evidence as to the value of his method, collected from English and American sources, is published by Dr. Apostoli in *Travaux d'Electrothérapie Gynécologique.* Drs. Thomas Keith and Skene Keith state that during more than two years in which they had employed Apostoli's methods they had not performed a single laparotomy for uterine fibroma.

It is proper to state, however, that some observers have not had as happy results with electricity as those just named. Dr. John Homans, of Boston, communicated last year* his results in thirty-four cases of uterine fibroma, in only two of which had the size of the tumor diminished. The general health had improved in fifteen cases, had been worse in two, and one death was attributed to the treatment. Profuse hæmorrhage had been diminished to a normal or bearable degree in nine, had been increased in six and unchanged in nine. Locomotion had been made easier in sixteen cases and more tiresome in five. Pain was lessened in six cases, increased in two, and unaffected in five. The menopause occurred in four cases after treatment had been begun. In consequence of such unsatisfactory results, Dr. Homans discontinued the use of electricity in this class of diseases in favor of abdominal section. It is well known that Lawson Tait is an outspoken antagonist to the Apostoli method. It is impossible to reconcile the conflicting reports as to the relative value of these two radically different plans of treatment; but it may be admitted by both parties to the dispute that electricity can never be practised successfully by the general practitioner, unless he knows more about electrical science than the average physician does. Just as special skill is required to perform an abdominal section for removal of the uterus and appendages successfully, so we may acknowledge that treatment of uterine fibroma requires special skill and knowledge. We also may conclude that at present the data are wanting which would enable us to say, at the beginning of treatment, which cases require surgical interference and which are proper subjects for electrical treatment. It is claimed by Joseph Price that, in cases which come ultimately for operation after a more or less prolonged course of electricity, the operation is rendered more difficult, and that adhesions result directly from the treatment. Just here there is irreconcilable antagonism between the advocates of the two methods. Apostoli claims good results upon diseased conditions of the uterine appendages. A recent writer,—Dr. Willis E. Hallowell,†—advocating this treatment, says: "When we find the tubes and ovaries alone inflamed, excepting for the present, at least, those cases in which they contain pus or other fluid, hydro- and pyo-salpinx, ovarian abscess, and cystic ovaries, we have in galvanism a very efficient curative agent. I have seen a number of tubes about the size of the little finger, more or less hard and very tender, become of normal size, consistency, and sensibility; and likewise ovaries, variously enlarged, prolapsed, and exquisitely tender, become of normal size, and, in many cases, return to their normal position."

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* *Provincial Medical Journal*, June 1, 1891, p. 362.

† *Northwestern Lancet*, 1891, p. 85.

The advice of this writer is much to the point. If pus or other fluid be present and its infective character be made probable by recency of occurrence, by fever, or by repeated attacks of pelvic inflammation, laparotomy is indicated, and at once. He further declares that if we can satisfy ourselves by good evidence of the existence of a closed collection of fluid, even though we have no evidence of its virulence, it is advisable to remove it by operation. Laparotomy may even find an ally in electricity. The good effects of the latter upon the general health and nutrition may place a patient in better condition to pass through the ordeal of a capital operation; on the other hand, an operation may fail in its good results owing to cellulitic exudation, which can be removed by subsequent electrical treatment. He concludes by the statement of his "conviction that we have in electricity an agent which, with careful study of what is already known and future investigations, will become, in the hands of a good electrician and a thorough gynæcologist, one of the most important weapons in the struggle against disease in woman, though it can hardly become the panacea which many of its advocates have claimed it to be."

Just what is claimed by the advocates of electrical methods may be learned from a communication read by Dr. Apostoli at the last International Medical Congress, of which the following summary presents the leading points:—

1. The constant galvanic current is indicated principally in gynæcology, in endometritis and fibroma; of paramount value in vascular derangements and pain (amenorrhœa, dysmenorrhœa,and metrorrhagia); it is also a potent means for arresting the growth of benign neoplasms, and promoting the absorption of peri-uterine exudations. It exerts a very salutary resolvent action in peri-uterine phlegmasias, and in some cases of catarrhal ovaro-salpingitis; but it is inefficient and even does harm in high dosage, especially if the negative pole is used in the uterus, in suppurative phlegmasias of the appendages. This variable intolerance, which is increased by an inflammatory condition of the appendages, proves a valuable means of diagnosis in determining the existence and character of peri-uterine, liquid effusions (sanguinolent or purulent), which have been unknown or merely suspected, and hastens in these cases a delayed or refused operation.

2. The effects of the constant galvanic current are polar and interpolar. The trophic and dynamic interpolar action, which increases as the square of the given intensity, is distinct from the polar action; this action, as Apostoli has shown us, differs according to the pole used, giving us the calorific action produced by the passage of the current (to increase interstitial circulation), and, finally, the antiseptic action of the positive pole, the experimental demonstration of which has been given us recently by Apostoli and Laguerrière.

3. Galvanic applications in high dosage, used in varying amounts from fifty milliampères upward, dependent upon the tolerance of the patient or the clinical indication, are the fundamental basis of Apostoli's method, and present the following points in their favor: (*a*) The utili-

zation of vascular drainage, a direct effect of the calorific action due to the resistance to the passage of the current, and in direct proportion to the square of the intensity. (*b*) The antiseptic or microbicidal action, which increases with the given intensity. (*c*) The rapidity and efficacy of the results produced, which are in proportion to the square of the electrical energy, the formula for which is analogous to that of the measure of the energy of other natural forces: $Q = \frac{1}{2} m V^2$. (*d*) The general applicability of this method to refractory cases (painful and subperitoneal fibromata, fungous endometritis, etc.), and to young women. (*e*) The infrequency of relapses, which, all things being equal, are least apt to occur when the strongest currents have been employed.

4. If the vaginal application of the galvanic current (which is the method proposed by Chéron for fibromata alone, and used since by A. Martin, Brache, Ménière, Onimus, Carpenter, Mundé, etc.) gives any results, they are very inferior to those of the intra-uterine application, which should always be the method of choice: (*a*) Because it utilizes the maximum of the given current and its energy. (*b*) Because it utilizes the antiseptic action of the positive pole, which is entirely local, and is not present in the interpolar circuit or at the negative pole. (*c*) Because it adds the derivative and caustic action of the intra-uterine application, treating thus at the same time the simple endometritis, or the secondary endometritis, which so often complicates fibromata and peri-uterine phlegmasiæ, thus insuring a more rapid, complete and permanent cure. (*d*) Because it is more effectual than the vaginal application in relieving pain and producing a tolerance for higher dosage, and, by thus allowing the use of currents of increasing intensity, the vascularity is increased and the best results are attained.

5. Vaginal galvano-punctures, two to five milliampères (one-twelfth to one-fifth of an inch) in depth, made with a filiform trocar of gold, insulated throughout except at the point, are a very useful complement to the intra-uterine treatment proposed by Apostoli, by better localizing the galvanic action, and by increasing, in some cases, the efficiency of small and medium doses.

The innocuity of his intra-uterine applications is proven: First, by the parallel innocuity of the chemical and other harsh methods of intra-uterine treatment; secondly, by the statistics gathered from all parts of the world, and particularly by his own statistics:—

From July, 1882, to July, 1890, he made 11,499 galvanic applications, which are classified as follows: 8177 positive intra-uterine galvano-cauterizations; 2486 negative intra-uterine galvano cauterizations; 222 positive vaginal galvano-punctures; 614 negative vaginal galvano-punctures. He treated 912 patients during this period, comprising 531 fibromas, 133 simple endometritis, and 248 secondary endometritis, complicating peri-uterine phlegmasiæ. He has had three deaths following operations (two galvano-punctures, one of which was for a subperitoneal fibroma, the other for an ovaro-salpingitis, and one galvano-cauterization for an ovarian cyst mistaken for a fibroma). He has observed thirty cases of pregnancy after intra-uterine applications had been made.*

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* *The Satellite*, Philadelphia, December, 1890.

**Details of Operation.**—The apparatus required are a good battery or source of electrical energy, capable of maintaining a current up to two hundred and fifty or three hundred milliampères when the body of the patient, a rheostat, and a milliampèremeter are in the circuit. The electrodes have already been sufficiently described. It may be stated, however, that for applications of less than one hundred milliampères the clay abdominal electrode may be substituted by towels wrung out of hot water or wet absorbent cotton laid upon the surface, upon which the lead plate to which the electrode is attached may be placed. The intra-uterine electrode, as pointed out by Massey, should be insulated nearly to its extremity, leaving only about two and a half inches exposed, so that it shall not cauterize the cervical canal and thus induce subsequent stricture. This electrode should be so constructed as to permit of thorough cleansing and boiling for several hours before it is used.

The battery should be tested prior to operation and the milliampèremeter examined. This is done by placing all the cells in action and gradually turning on the controller, while watching the effect upon the meter. The controller should then be reversed until the current is entirely cut off, when the apparatus is ready for use in the operation. The conducting cords should be carefully examined, so as to detect any possible break. Determine the proper size and curve of the sound, and properly disinfect it. The curve is best made with the aid of an alcohol-lamp, and while the sound is heated, the insulation may be secured by applying gum-shellac in such a way as to cover all breaks and weak spots. Arrange the gynæcological table or couch so that it will be convenient to hold the sound in place with the left hand, leaving the right hand to manage the current controller.

The patient should be informed of the character of the operation and of the necessity of keeping absolutely still, so as to avoid shock or disarranging electrodes or wires. The application should not cause pain beyond a slight burning, and the patient should at once inform the operator if the current causes more pain than this, when the current can be promptly diminished by the controller. The bowels should be evacuated by a purgative, followed by an enema, and the vagina should have a preliminary irrigation with an antiseptic solution shortly before the operation. If there should be any pimples or abrasions on the surface of the abdomen they should be covered with small pieces of waxed paper, or paper smeared with vaselin or lard upon the surface next to the skin. The details are further described as follows (abbreviated from Massey) :—

**Placing the Electrodes.**—1. Apply the clay (or the Martin) electrode smoothly upon the abdomen, and attach to the binding-post the cord of the plate which is desired to be indifferent.

2. Attach a disconnected conducting-cord firmly to the intra-uterine electrode, and insert it as any other sound is inserted, using all the precautions recommended in the passage of this instrument. At first it may only be possible to introduce a filiform, flexible instrument, but after a positive cauterization subsequent introductions will be easier, and larger instruments may be used. A speculum, as the rule, is not needed, as the sound should be guided by the finger alone in its introduction ; it should

be held firmly in place by the left hand during the passage of the current, the finger being in the vagina.

3. After seeing that the connections are all right and the controller at zero, the cord of the intra-uterine electrode should be attached to the binding-post of the pole that is to be active. The patient now being ready, the current is slowly turned on, until thirty or forty milliampères are shown by the meter. After resting at this point for a few minutes ten or twenty milliampères may be added; but, as the rule, forty or fifty milliampères will suffice for the first treatment, especially if the patient be nervous. The meter should be constantly watched, as well as the patient's countenance, and on the first sign of pain the current should be reduced by the controller. The active electrode may be moved, so as to bring it in contact with all parts of the endometrium, care being taken not to perforate the fundus. The current is maintained at its maximum from two to ten minutes, and then gradually lessened. When heavy currents are used (two hundred or three hundred milliampères) the time should be shortened, except in tumor cases. The decrease of current should be gradually produced by slowly reversing the controller until the needle of the meter falls to zero. The sound is then removed, and the abdominal plate taken away. It is best to have the patient rest awhile before going home, particularly if she is obliged to walk. Massey insists that, in every case where at least a hundred milliampères have been used, the patient should lie down immediately upon reaching home, and remain inactive during the remainder of the day, so as to avoid inflammatory reaction. There will be sanguineous, followed in twenty-four hours by a purulent, discharge, and there may be some colicky pains, but the recumbent posture, with antiseptic vaginal irrigation twice daily, will soon cause these to subside. For the treatment of many cases of endometritis, unaccompanied by hyperplasia, currents of twenty to thirty milliampères are quite sufficient, while the heavy currents are especially required in tumors, large hypertrophy, or inflammatory exudation. Three times a week is as often as the operation can be performed with safety; in many cases twice, or even once, a week will suffice.

Dr. Massey gives the following contra-indications to operations under the Apostoli method:—

1. The presence of the menstrual flow.
2. The existence of acute metritis or perimetritis.
3. The co-existence of abscess anywhere in the pelvis.
4. Pregnancy.

**Faradism in Gynæcology.**—Apostoli uses the faradic current in acute inflammatory affections of the uterine and peri-uterine tissues and appendages. No stage of the inflammation, even the most acute, contra-indicates the employment of the current. The bipolar vaginal electrode may be used, applied in the neighborhood of the severest local pain. (Liebig and Rohé.)

In **amenorrhœa** both galvanic and induced currents are employed. It is not necessary to apply the electrodes locally to the uterus or ovaries, since experience has shown that electricity applied to a distant portion of the body will increase the menstrual flow, or stimulate it if arrested (except in pregnancy). The faradic current is employed in general faradization, dorso-abdominal with the dry brush to the abdominal walls, the inner sides of the thighs, and also to the soles of the feet.

In **obstructive dysmenorrhœa** Apostoli uses faradization with a bipolar electrode, the strength being regulated by the feelings of the patient. **Congestive dysmenorrhœa** may be relieved by weak currents, either intra-uterine (Apostoli) or with the wire brush to stimulate the cutaneous circulation over the abdomen, while galvanism from the cervix to the spine (anode to cervix, cathode externally) may be combined with advantage. The same treatment is advised for painful ovaries and **nervous dysmenorrhœa**; also, for non-periodic or constant pains in the pelvis. Daily, or even twice a day, is not too often for the application of faradic currents, which should be extremely rapid and perfectly smooth, in order to obtain the sedative effects.

In **threatened abortion** an insulated vaginal electrode may be placed against the os and a soft-sponge electrode applied over the hypogastrium or lumbo-sacral region for ten minutes at each sitting, using mild, smooth currents. Dr. W. T. Baird, of Texas,* used it in three cases, in which he succeeded in arresting hæmorrhage and preventing the expulsion of the ovum, the patients afterward going on to full term. To arrest hæmorrhage after abortion, owing to a relaxed uterus, the same current may be employed, either in the same manner, or by using a double uterine electrode, by means of which the current can be definitely localized in the uterus and produce more forcible contraction (Liebig and Rohé). Even in **placenta prævia** the faradic current is recommended, as strong as can be borne, in order to produce strong equable contractions of the muscular fibres. Dr. Baird claims that **during parturition** faradism is a valuable agent for relieving suffering, and may take the place of chloroform. He uses the mediate method, one electrode being placed over the patient's sacrum, the other being attached to a wristlet upon the operator's arm; he then passes his hand over the patient's abdomen during the pains. **Premature delivery** may be brought on by very strong currents, either faradic or galvanic.

**Agalactia,** or **deficient secretion of milk** after delivery, yields promptly to faradic stimulation of the mammary glands. Dr. Fry reported a case of suppressed lactation in which galvanism was employed with complete success, only two applications being required. The active electrode (cathode) was made of sheet-lead, three by five inches, moulded so as to fit over the breast, and covered with absorbent cotton. The anode was placed at the back of the neck. An average current of ten milliampères was passed for eight minutes through each breast.

**Involution of the uterus** after labor is hastened by faradization, according to Apostoli and Tripier. Septic infection is thus prevented by securing contraction of the organ. The lumbo-abdominal method is usually sufficient, with daily sittings for a fortnight, or longer if necessary.

In disorders of the male genito-urinary organs electricity is largely used with marked success. In paralysis, hyperæsthesia, stricture, functional impotence, all three forms of electricity may be employed locally.

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* *American Journal of Obstetrics*, April, 1885, p. 341.

**Paresis or paralysis of the bladder** resulting from various causes, with retention or incontinence of urine, is often markedly relieved. An insulated urethral electrode is passed into the bladder, the other electrode being placed over the perineum, hypogastrium, or lumbar region, and a current passed as strong as the patient can bear, gradually increasing the length of the sittings, though not exceeding ten minutes. The bladder should be partly filled with a weak borax solution, so as to diffuse the current during its passage; and if there should be decomposition of urine with cystitis, irrigation of the bladder should be practised once or twice daily, with mild antiseptic solutions.

In **nocturnal incontinence of urine** faradism is very successful, one electrode being placed in the lower dorsal region of the spine and the other over the pubes; or, an insulated urethral electrode may be introduced as far as the neck of the bladder.

**Functional impotence, spermatorrhœa,** and **frequent nocturnal losses** may be relieved in a similar manner to that just indicated for nocturnal incontinence of urine. In addition, the wire brush may be applied to the external genitalia and to the inner side of the thighs, especially in functional impotence and feeble erections. Mild galvanic cathodal applications to the neck of the bladder will also markedly reduce irritability and arrest the discharges in spermatorrhœa.

In **hypertrophy of the prostate** Tripier recommended an insulated sound in the urethra and one in the rectum, with the faradic current. An electrode of special shape for the rectum has been made, at the suggestion of the author, for application to the base of the bladder and prostate, the neutral electrode being placed over the abdomen.

**Electrolysis in Medicine.**—In cases of stricture of the urethra, rectum, or œsophagus, due to cicatricial stenosis, the application of the method as practised by Dr. Neumann, of New York, to stricture of the urethra, will serve to illustrate its usefulness in all such conditions. It should be understood that this is entirely different from cauterization such as seen in the Apostoli method. Much milder currents are employed, and the principal object in view is to cause the absorption of the inflammatory exudate, or scar-tissue, which softens under the electrolytic influence of the current; but there is no charring of tissue and no subsequent sloughing. Insulated urethral sounds are used, terminating in an exposed olive-shaped bulb, which should be a little larger than the calibre of the strictured urethra. After being made thoroughly aseptic, this is passed down to the tender spot in the urethra and the negative cord attached; the other electrode, covered with sponge or cotton of the usual shape, may then be applied to the thigh; the current is then gradually turned on until four or five milliampères are passing. The sound is then gently guided through the stricture, allowing it to make its own way until the stricture is passed; the circuit may then be opened and the electrode withdrawn. The sittings should be twice a week, and should not exceed five minutes each. After each operation, the parts should be bathed with hot water containing boric or carbolic acid. Some bleeding and increased tenderness may be noticed after the first few applications, but these become less, and in from ten to twelve sittings the cure is complete. In many cases, though, no positive prediction can be made as to the time required. Electrolysis is recommended by Heryng for the removal of hard, diffused tuberculous infiltrations of the larynx and in chronic affections of the vocal cords with little or no superficial ulceration. He has found it of service also in counteracting the tendency to dangerous hæmorrhage in the removal of nodules of the ventricular bands.

In **new growths, tumors,** etc., electrolysis promises to be of great service. This method has likewise proved of value in promoting cicatrization of acute and chronic ulcers. Dr. J. Inglis-Parsons has reported[*] encouraging results from the treatment of rodent ulcers by electrolysis. In ordinary cases he found one application sufficient, but when the ulcers were large the operation was once or twice repeated. The procedure prevents hæmorrhage, is not followed by pain, causes no shock, and if the wound is kept aseptic no rise of temperature takes place. Two needles are employed with a current strength of 200 to 400 milliampères. The caustic action of both poles is freely used, and the current is constantly alternated with a hand commutator. The amount of destruction can be accurately regulated by increasing or diminishing the strength of the current. In connection with the introduction of various remedies through the skin,—**electro-cataphoresis,**—some remarkable results have been obtained by Adamkiewicz, Peterson and others. The fact that medicines may thus be introduced into the body has already been mentioned, and it seems evident that this new method is capable of very valuable applications. The medicament is carried directly to the diseased cell, and thus produces a more marked effect than if it were diluted by the circulating fluid. Moreover, electrolysis of fluids and solids tends to occur in the vicinity of the poles, thus liberating remedies in nascent form, which is one of special activity. Dr. Woodbury treats syphilitic new growths with lithium-iodide solution, using absorbent-cotton electrodes, and urges a similar treatment of various tumors in the same manner. The success of Dr. A. C. Garrett, who reported one hundred and fifty-seven cures out of one hundred and eighty-six cases of tumors (indurations?) of the breast, by means of direct application of the galvanic current, should encourage further experiment in this direction. "There is reason to believe," says Dr. Rohé, "that the limitations of electrical treatment of malignant tumors have not yet been reached. It was suggested by Woodbury[†] that various chemical agents might be tested, until one be found which has a special inimical influence to the cancer development, and that the prospects then would be favorable for the successful treatment of malignant tumors by the introduction of such agents by means of electro-cataphoresis directly into the interior of the growth.

In **goitre** the galvanic current may be used percutaneously, but better results are obtained by the use of needles with negative electrolysis. Dr. Jas. Hendrie Lloyd[‡] uses three gold-plated needles well insulated to within one-third of an inch of the point, connected by a branching cord so that all were attached to the negative pole. The needles were inserted well into the goitre, far enough to protect the skin by the insulating material. The positive pole, a large flat sponge, was applied to the nape of the neck. The greatest strength was twenty-four milliampères, but this could not be kept up; the average was about fifteen to eighteen milliampères. The *séance* lasted twenty minutes. Patient was cured by fourteen applications.

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[*] *Lancet*, November 11, 1893, p. 1175.

[†] Paper read before the Philadelphia College of Physicians, "On the Employment of the Cataphoric Action of the Galvanic Current for the Removal of Syphilitic New Growths. A Contribution to the Medical Treatment of Tumors." *Medical News*, June 21, 1890.

[‡] "The Treatment of Goitre by Galvano-puncture." By Jas. Hendrie Lloyd. *University Medical Magazine*, December, 1890.

In **enlarged lymphatic glands,** when suppuration has occurred, the galvano-cautery affords an ideal method of opening glands. The wire-point cautery may be employed to make punctures into the substance of enlarged glands, the gland-structure being partly destroyed and partly condensed or absorbed under the action of the negative electrode (five to twenty milliampères twice weekly). Strong, frequently interrupted **faradic currents** have also been found useful in enlarged lymphatic glands.

In **orchitis,** after the acute stage has passed, percutaneous galvanization, followed by faradization, reduces swelling and promotes absorption. In **atrophy of the testicle,** faradism with the dry brush and descending galvanic currents to testicle and spermatic cord will increase the circulation and favor nutrition. In **hydrocele,** percutaneous applications of both forms may be practised, but the effect is more prompt, according to Liebig and Rohé, if the sac be punctured with a needle-electrode (cathode), using a current of twenty to fifty milliampères to produce electrolysis.

**Application of Electricity in Dermatology.**—Various morbid conditions of the skin are susceptible of marked amelioration under the action of the several forms of electricity.* Only a few of the principal applications can be mentioned here.

Various nervous disorders, pain, hyperæsthesia, anæsthesia, œdema, urticaria, and neurotic bullous eruptions are successfully treated by galvanism or faradism. General electrization (electric bath, static "breeze," etc.) is valuable in neuroses with cutaneous manifestations. **Itching,** or **pruritus,** which is such an annoying accompaniment to various lesions, is promptly, if not permanently, relieved by swelling faradic currents. Static electricity has been used with success by Leloir in obstinate cases of paræsthesia, especially when the anal and vulvar regions were involved. Raynaud's disease (local asphyxia), it is claimed, may be checked and the angio-spasm permanently arrested by a strong faradic current. In a similar manner **chilblains** or **pernio** may be benefited. In either, if trophic symptoms are present, the combined treatment with galvanism and faradism is useful. Dr. Hugo Helving employs galvanism with excellent results in the treatment of frost-bitten nose, applying both poles to the sides of the nose and passing a moderately strong current for five or ten minutes, moving the electrodes slowly at the same time. Static electricity removes the pain and soreness of a superficial burn.

In various forms of inflammation of the skin, electricity may be judiciously employed, especially in the more chronic forms. In **eczema,** the author sees the best results from the faradic current applied by a metallic-ball electrode. Anodal galvanic applications also give good results in acute forms, while in the chronic form with much infiltration the cathode is preferable. In **herpes zoster,** galvanism gives better results than faradism. The anode to the spine and the cathode along the distribution of the affected nerve, with mild currents, generally relieve the pain and check further eruption. It is also valuable in the treatment of the resulting intercostal neuralgia.

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* For further clinical experience see author's work on "Diseases of the Skin." New York: D. Appleton & Co., 1892, pp. 114–119.

In **alopecia,** the dry faradic brush over the bald spots is often beneficial. The drawing of sparks with static apparatus is recommended by Ranney and others. **Acne** may be similarly treated with the faradic current, or galvanism may be applied with anode to back of neck and the cathode to the seat of eruption. In **rosacea,** Dr. Hardaway practises electro-puncture; introducing a delicate needle into the enlarged veins and connecting it with the cathode, a current (of one or two milliampères) is passed through the needle, causing coagulation of the blood and occlusion of the vessel. Mutiple galvano-punctures of the hypertrophied skin will greatly promote resolution.

In **keloid, hypertrophied scars, cicatrices,** etc., the same authority has obtained the best results from galvano-puncture. **Warts, moles,** and **small fibromata of the skin** yield readily to the same treatment without leaving disfiguring scars. Currents of two to six milliampères are used. Small **nævus telangiectasis** is successfully treated in this way, the negative needle being thrust in various directions through the base of the growth. **Cavernous angiomata** and **vascular nævi** are less amenable to this treatment, but with judicious management and patience complete success may follow the application of this method. The galvano-cautery may be used in removing such a growth, either by the use of a loop or the various flat burners which are used as knives.

**Removal of Superfluous Hair—Hypertrichosis.**—Electrolysis is now very generally employed in destroying hair-bulbs and removing hair growing in abnormal situations. First employed by Dr. Michel, of St. Louis, in **trichiasis** with successful results, the method was afterward extended by Dr. Hardaway to the removal of superfluous hair in any situation. When properly used this method causes neither pain nor disfigurement, but permanently removes the source of the trouble. The method is easy and the instruments are few in number; a battery capable of yielding a current of from one-half to two milliampères, a needle-holder armed with a No. 12 sewing-needle of steel or alloyed platinum (the latter being preferable because flexible), and a sponge electrode are all that are required. It is convenient to have the patient sit in a chair with a good head-rest during the operation, and the operator may find it necessary to use a good hand magnifying-glass to enable him to introduce the needle directly into the hair-follicle by the side of the hair. The needle being attached to the cathode, the current is made to pass by the patient touching, with his disengaged hand, the sponge of the electrode held in his other hand. The effect of the current will be immediately observed; the tissues around the needle will be slightly raised up and froth will issue from the mouth of the follicle. In about half a minute the hair should be gently pulled with the tweezers or cilia forceps; if it does not immediately come away the current should be passed a short time longer. The circuit is broken by removing the hand from the sponge, which gives less pain than if it be broken or closed with the needle. A sitting should last not longer than fifteen minutes, and the hairs destroyed should not all be from one spot; otherwise there may be some inflammatory reaction, or even sloughing and production of scars. After the operation a mild astringent lotion is ordered and applications of hot water directed to be made several times daily to reduce hyperæmia. If the operator has been successful in destroying the papilla the hair will not return, but in a certain proportion of cases the papilla escapes destruction and the hair is regenerated. This may be due to a twist in the hair-shaft in its passage through the skin, and partly to inexpertness on the part of the operator. Some hairs may require repeated removal before the papilla is finally destroyed. In young persons, especially, new hair-papillæ are constantly developing in the skin, and the appearance of new hairs after operation does not, therefore, mean that the operation was a failure. Such patients it is necessary to warn before operating that new hairs may appear though the older ones were destroyed by the operation. In young individuals the process may have to be repeated several times before the operation is finally crowned with success. The needle-holder of Hardaway is a good instrument, but one has recently been devised by Leviseur which is a decided improvement. In this instrument the needle can be held either directly projecting in a straight line or at an acute or obtuse angle with the handle. The operator holds the instrument like a writing-pen, with the needle at the proper angle to enter the follicle with the greatest readiness.

**Electricity for Preventing the Loss of the Hair, Premature Grayness, Calvities.***—The object of treatment is to promote nutrition of the scalp and hair-bulbs. This is promoted by the practice of massage, the use of hot, alternating with cold, douches, by the shampoo with either hard or soft soap, and, above all, by electricity. Both galvanism and faradism have been employed, and both are efficacious. The uninterrupted current should, in the beginning, be a mild one, not exceeding three or four milliampères. It may be applied by moistened sponge electrodes, the hair also being moistened and parted at intervals. An excellent mode of administering the current is through a brush with metallic bristles. Faradic electricity is conveyed in the same way through a wire brush, the patient holding the moistened sponge electrode. The brush is to be passed over the scalp slowly until the skin becomes quite red.

**Removal of Foreign Bodies from the Eye with the Electro-Magnet.**—One of the neatest applications of practical electricity to medical purposes is seen in the removal of pieces of iron or steel from the interior of the eye with the electro-magnet. Several forms have been devised since the instrument of Professor Hirschberg, of Berlin, was first introduced, in 1855, varying in slight details, but all consisting essentially of a fine insulated wire coil with a core of soft iron, to which is attached a tip, also of soft iron. After closing the circuit, the current being furnished by a single galvanic cell, the point of the instrument is brought to the edge of the wound, or, if the foreign body be deeply imbedded in the eyeball, it may be necessary to puncture the sclerotic and introduce the point of the magnet until the substance is attracted by it and removed from the eye, the current not being broken until the instrument is free from the eye. Of course, only particles of iron and steel can be removed by the magnet, but, as they frequently find their way into the organ, it is an admirable contrivance, since the foreign body may be removed without causing further irritation.

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* See article by author on the "Hair with the Toilet. Care in Health and Treatment in Disease." *Medical Bulletin*, Philadelphia, April, 1892.

Dr. Casey A. Wood, of Chicago, recently reported a case of electromagnetic extraction of a piece of steel from the vitreous chamber of the eye, with preservation of sight. The magnet used is known as Snell's, manufactured by Meyrowitz Bros., of New York. With this he prefers a small two-volt storage cell, which is more portable than the ordinary acid cell, and is very efficient. The details of this case are quite instructive. Atropine solution had been instilled into the eye, shortly after the injury was received, by the attending physician, and Dr. Wood saw the patient seven hours after the accident. There was a penetrating wound of the cornea and iris, and the anterior chamber contained blood. No clear view could be obtained of the fundus. It was decided to wait until the effused blood had undergone absorption. The conjunctival sac was thoroughly disinfected, more atropine instilled, and the eye dressed with boric-acid powder and a bandage. Three days later a wound in the lens could be plainly seen through the dilated pupil. Two clots were seen in the vitreous; only portions of the fundus could be seen. It was decided not to attempt removal of the foreign body through the original wound. Four days after the accident, "the patient was anæsthetized and a straight equatorial incision (eight millimetres long), was made with a Graefe knife through the sclera, about a centimetre behind the limbus, at the lower outer quadrant of the hemisphere. Another wound of the same length, but at right angles to this, was first carried through the conjuctiva and Tenon's capsule, so that when both wounds were closed the vitreous chamber was effectively shut off from the outside air. A bent and flat needle was carefully introduced into the vitreous, and, after several re-introductions and 'fishing' about, a small bit of steel was withdrawn, attached to the tip of the magnet-end. Little or no vitreous was lost. A few stitches were put through the conjunctival flaps, and the eye was again dressed with boric-acid powder. The greatest care was observed as to the use of antiseptics, and the wound healed without the least difficulty." The extracted metal weighed 17.7 milligrammes.*

The electric probe of de Wilde consists of two insulated wires contained in a flexible sheath, the ends being brought out at the extremity of the instrument. As soon as the wires touch a metallic object the circuit is complete, and a small electrical bell or "buzzer" indicates the fact. This instrument requires actual contact with the foreign body in order to produce the signal. The **electrical induction balance** is an ingeniously constructed apparatus, which will indicate the presence of a bullet or other metallic body when buried in the tissues. Several varieties have been constructed, but they are essentially the same, and depend upon the principle of better conduction of the galvanic current, and hence greater induction in a secondary coil, when the metallic object is included in the field or interpolar region. Dr. Kummer* recorded a case where a needle having become buried in the knee, its precise location was detected by an ordinary galvanometer, and also by a freshly-magnetized needle. Dr. Addinell Hewson† claimed that in a similar way he had been enabled to detect, by means of a small pocket compass, the presence of a bullet imbedded in the muscles of the back. Unless the projectile were of iron or steel this experiment would not succeed with such simple instruments. The electrical induction balance and the electric probe, however, will detect the presence of any metallic substance capable of conducting the electrical current. Dr. A. B. Kirkpatrick‡ reports a case of gunshot wound, in which the electric probe was used with excellent results.

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* *American Journal of Ophthalmology*, April, 1891, p. 127.

In **nose and throat diseases** the galvano-cautery has been extensively used, and, in the opinion of some, greatly abused. The chief advantages over the knife and cold-wire snare are: the ease and convenience of the apparatus, its perfect asepsis, and the counter-irritant and stimulating effect to be obtained by minute points of cauterization. In skillful hands it warrants all the praise bestowed upon it, because its use is then limited to appropriate cases; while in unskillful hands it is indiscriminately employed, and sloughing and necrosis caused by injudicious application. The source of power is now almost universally the storage cell, although the cautery battery, as devised by Seiler, is quite sufficient for all ordinary purposes; when the time of actual use is very brief, polarization does not have time to occur.

**Nasal hypertrophies** of mucous membrane are readily reduced by a touch of the galvano-cautery. The platinum knife or probe should be inserted in a universal handle, bearing a spring switch, so that the current does not pass until the instrument is in place and can be instantly discontinued. If the instrument adheres, it should not be abruptly withdrawn, or it will tear off a portion of mucous membrane and cause bleeding and an open wound. On the contrary, if the instrument is permitted to remain for a moment or two the natural secretions will be restored and it will easily drop out. In applying the cautery to posterior hypertrophies the rhinoscopic mirror should always govern the application, so that the operator can see just what he is doing.

In **granular pharyngitis** of singers and public speakers, accompanied by thickening in bands and bunches of enlarged follicles, excellent results follow the galvano-cautery. Enlarged papillæ at the base of the tongue can be reduced by cautery punctures, or removed without pain or hæmorrhage by the wide platinum snare.

As the rule, the wire should be heated to a cherry-red heat, and in nasal work it is often of advantage to use a shield, such as an ordinary metal aural or nasal speculum, or Shurley's ivory-blade speculum. It is a powerful hæmostatic and resolvent; and, when used as a destructive

* *Revue Médicale de la Suisse Romande*, October, 1890.

† Proceedings American Medical Association. Surgical Section. Newport Meeting.

‡ Proceedings Philadelphia County Medical Society, October 14, 1891.

agent, its action is perfectly under control, and is limited to the area operated upon.

Recently, the galvano-cautery has been advocated as an application to the throat in **diphtheria**; but, while we are in possession of such antiseptics as hydrogen dioxide and chlorine and such solvents of false membrane as papoid and lime, it is not likely that this plan will receive much favor. In **chronic enlargement of the tonsils** the use of the galvano-cautery is often productive of decided diminution in bulk.

In keratitis fascicularis and ulcerations of the cornea, galvano-cauterization gives good results; and Darier[*] reports excellent effects in the treatment of two cases of **purulent ophthalmia**. Antiseptic douches with instillations of iodoform followed its cauterization.

**Chronic Diseases of the Middle Ear.**—Dr. Baxter has reported ten cases in which the use of the constant current was followed by improvement. The patient is placed with the head inclined and the external auditory canal filled with warm water. An aural electrode, or small wire insulated to within two millimetres of its point is introduced into the canal and the sponge electrode is held in the patient's hand. From 5 to 10 milliampères of current are passed through the parts. The duration of an application is from 3 to 6 minutes. After the operation the patient is kept quiet for a time in order to avoid the occurrence of vertigo.

**Direct Electrization of the Stomach.**—Owing to the inconvenience of the use of the stomach-tube, Kussmaul's stomach-electrode, introduced in 1877, was never a practical instrument for local or direct electrization of this organ. Recently, Dr. Einhorn[†] has constructed a novel form of electrode, on the principle of the stomach-bucket, and gives it the name of the "Deglutable Stomach-Electrode." It consists of a hard-rubber capsule (about one and one-quarter inches in length) perforated with numerous openings, this cage serving to protect the metal knob within from direct contact. The connecting wire runs through a fine, flexible-rubber tube. The capsule is readily swallowed and tolerated by the patient, and contact is secured, as in Bardet's electrode, by water in the stomach. The faradic current has been generally employed, and in all cases the degree of acidity of the stomach has been markedly increased. The author makes a preliminary report, which goes to show that most decided results have been obtained in cases of dilatation and in grave cases of chronic gastric catarrh. Two cases of pure gastralgia showed an amelioration after use of the constant current. He concludes that faradization is most useful in dilatation and atonic conditions of the cardiac and pyloric orifices and also in chronic glandular gastritis. Gastralgia of nervous origin or dependent upon ulcer receives more benefit from galvanism. The latter form of electricity has an excellent influence upon cardiac affections dependent upon gastralgia. The majority of cases of hyperacidity were improved, but required the administration of alkalies in the usual way.

**Electricity in Intestinal Occlusion.**—Where intestinal occlusion is due to transient intestinal paralysis through defective innervation, Semmola has recently pointed out that the constant current has a truly marvelous effect. He reports a case of diarrhœa, followed by acute constipation and colicky attacks, with obstinate vomiting and retention of urine. The positive electrode, olive-tipped, was inserted into the rectum as far as the sigmoid flexure; the negative pole, moistened with salt water, was moved about over the abdomen in various directions, especially along the colon. A current of ten milliampères was used. Each application lasted about ten minutes, and was used three times a day. At the end of the third application the retention of urine ceased, the paroxysms were less severe, and the patient had visibly improved, but it was not until the ninth application, at the end of the third day, that the bowels were moved. The treatment continued two days longer, and the patient recovered.* In other cases of a similar nature even more rapid relief has been obtained by faradism, an insulated sound with free metallic end being inserted into the rectum and a moistened conductor applied to the wall of the abdomen.

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[*] *Journal American Medical Association*, November 29, 1890.

[†] *Medical Record*, May 19, 1891.

**"Electric Injections."**—Under this name a method of using the constant current in cases of fæcal accumulation and intestinal paralysis has been described. The rectum is filled with salt water in order to avoid the cauterant effect of a direct application to the mucous membrane. A metallic conductor connected with the positive pole is enclosed in an elastic sound and communicates the electricity to the water. The circuit is closed by placing a large negative electrode upon the abdomen. MM. Boudet and Larat have employed this method with benefit in a considerable number of cases.

**Effects of the Galvanic Currents upon the Vitality of Disease-Germs.**—From various experiments by Cohn and Mendelsohn and others, it has been ascertained that the vitality of bacteria may be destroyed by the passage of a current of electricity. Blackwood states that galvanism readily destroyed all varieties of germs, from twenty-five to one hundred and seventy-five milliampères being required. Strong currents, such as from ten to thirty-five ampères, not only killed the microbes, but caused them to disappear entirely. Quantity or ampèrage is the main essential: for low quantity under strong voltage was ineffectual, whilst high ampèrage under comparatively low pressure was efficient always. Blackwood states † that he has obtained satisfactory results in actual practice in a number of diseases, such as scabies, lichen, favus, etc. In typhoid fever, dysentery, phthisis, diphtheria, intermittents, and sporadic cholera he reports good results from the application of galvanism as above indicated. He suggests this field to other experimenters as a promising one for further investigation. According to reported experiments by Apostoli and Laguerrière,‡ the action of the constant galvanic current upon cultures is in direct relation to the intensity of the current estimated in milliampères. A current of three hundred milliampères and above, applied constantly for five minutes, kills charbon bacteria, while lower degrees of intensity of current merely attenuate the culture and render it less virulent. The positive pole alone produces this effect; the interpolar action and negative pole are indifferent. The general conclusion is, that the continuous current in ordinary medical dose (fifty to three hundred milliampères) has no action *sui generis* upon microbe cultures in a homogeneous medium, and that its unique positive polar action should be referred to the liberation of acids and of oxygen.

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* Communication to Section of Medicine, British Medical Association. *British Medical Journal*, February 20, 1892.

† W. R. D. Blackwood, M.D., "Has Electricity any Action as a Germicide?" *Medical Bulletin*, February 18, 1892.

‡ *La Tribune Médicale. American Lancet*, December, 1890.

**Gonorrhœa,** which is known to be of infectious origin, offers a field for the use of the antiseptic effects of galvanism; but, unfortunately, the urethra is too sensitive in the male sex to permit the use of the high currents required; yet, in women, good results have been reported by Prochownik.[*] He treated ten cases of acute gonorrhœa with very rapid recovery. The gonococci were absent from the secretions after the fourth application, and all the morbid phenomena disappeared after the ninth application. The positive pole was carried into the uterus, and a current strength of one hundred and twenty milliampères was used from eight to ten minutes. The necessary precautions of cleaning the vagina and vulva and using no other instruments than the electrode were scrupulously observed. The same author attempted to treat gonorrhœa of the urethra in the same way, but patients could not endure currents stronger than thirty to forty milliampères, while a current strength of from eighty to one hundred milliampères is essential to the destruction of the gonococci.

**Electric Illumination in Medicine and Surgery.**—Czermak (in 1858) first called attention to illumination of the larynx by transmitted sunlight, and subsequently this method of illumination was greatly advanced and improved by Voltolini, by whom the electric light has been utilized for this purpose. Dr. W. Freudenthal presented an instrument containing an Edison lamp, which is applied closely to the larynx externally, while the laryngoscopic mirror is used in the usual way.[†] The instrument is made by Reynders & Co., New York. It appears to have special value for illuminating the subglottic region of the trachea. This method was discussed at a meeting of the American Laryngological Association, but did not receive much endorsement.

For descriptions of electric otoscopes, laryngoscopes, gastroscopes, urethroscopes, and others of similar scope, the reader is referred to special works on electricity and to the illustrated catalogues of the instrument-makers and electricians. Their chief interest lies more in the direction of diagnosis than therapeutics.

## KINESITHERAPY; MECHANOTHERAPY; MASSO-THERAPEUTICS. MASSAGE AND REST-CURE.

**History.**—**Kinesitherapy** (*κινησις*, motion), or the treatment of disease by mechanical means, is a well-established therapeutic resource. The high esteem in which gymnastics was held by the ancients for maintaining health and vigor led inevitably to the employment of modified, and especially passive, exercises in the treatment of appropriate diseases. Herodicus became so famous for his application of gymnastics to the improvement of health that Plato is said to have accused him of doing an ill service to the State by keeping alive people who ought to die, because, being valetudinarians, they caused more expense than they were worth to the community. In many places in the writings of Hippocrates we encounter expressions of his high opinion of the value of systematic and scientifically-directed massage. For instance, "It should be kept in mind that exercise strengthens and inactivity wastes." "Friction can relax, brace, incarnate, attenuate: hard braces, soft relaxes, much attenuates, and moderate thickens." "The physician ought to be acquainted with many things, and, among others, with friction." These extracts are from the Sydenham Society's translation of the genuine works of Hippocrates; in Littré's translation the last sentence is more appropriately rendered, "The physician should possess experience in many subjects, and, among others, of massage."

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[*] *Centralblatt für Gynäkologie*, and *Pac. Rev. of Med. and Surg.*, November, 1891.

[†] *Medicinische Monatsschrift*, N. Y., November, 1889.

The term massage (*μασσειν*, to knead or rub) is applied to the employment of pressure, strain, and other peculiar manipulations of the soft tissues of patients with the view of bringing about physiological and therapeutical effects. Known and practised by the Chinese from the earliest period, by the ancient Persians, and latter by the Greeks and Romans, its use, in one form or other, is almost universal at the present day, not only among civilized nations, but also among the aboriginal inhabitants of Africa and the South Sea Islands. Among the natives of Tongo and the Sandwich Islands, for instance, a crude though elaborate system of shampooing is practised, which is essentially a form of massage. During the Middle Ages, the nations of Europe lost appreciation of this important handmaid of therapeutics, which was permitted to sink into oblivion by the medical institutions. However, it continued to be practised by the laity, who often associated it with superstitious forms and observances, which brought it into still further scientific disrepute. It is to the French that we are indebted for the rediscovery and rehabilitation in medicine of this valuable therapeutic agent. Toward the latter part of the eighteenth century, Tissot (1780) and Meibom (1795) laid the medical world under obligation by their writings; the subject, however, attracted very little notice, until at a comparatively recent period Mezger, of Amsterdam, and his pupils Berghman and Helleday (1873) gave it a scientific foundation. The enthusiasm of a Swede, Peter Henry Ling, was necessary to popularize mechano-therapeutics, and in this he was so successful, particularly in his native country, as to be regarded, by many, as the creator of the modern movement cure. His leading physiological idea was that the nourishment and development of the muscles depended upon their use and amount of active movements they perform. The peculiar merit of Ling, according to Schreiber (who has given us an excellent "Manual of Treatment by Massage and Methodical Muscle Exercise"*), lies in the fact that "he re-established the gymnastics of the ancients on a scientific basis, and, using the then known results of skilled German gymnasts, penetrated still deeper into the writings of ancient nations, and became one of the first to elaborate a complete system on an anatomical and physiological basis."

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* Translated, with the author's permission, by Walter Mendelson, M.D., of New York. Philadelphia: Lea Bros. & Co. 1887.

**Technique of Masso-Therapeutics and Mechanotherapy.** — The mechanical treatment of diseases presupposes acquaintance on the part of the operator with regional anatomy and with the teachings of human physiology. It is true that in the hands of uncultured persons, who practice massage in an empirical manner, excellent results have been obtained, but this is due to the fact that ignorant people are often shrewd observers and are not modest in proclaiming their successes, while their failures are kept in the background. The so-called art of bone-setting, by which stiffened joints are restored to motion by systematic mechanical treatment, as practised in this way, often is successful, and such cases are widely published; whereas, if the treatment was a failure, the result would not be sufficiently rare or interesting to be noticed.

In acquiring the art of massage, it is of great advantage to have a skilled instructor to teach the various manipulations and their applications, and at the present time such experienced practitioners are to be found in many of our large cities. In Philadelphia, a thorough course is given under the direction of Dr. Benjamin Lee, who has devoted his life to the study and practice of mechanotherapy. It is, however, a manual art and cannot be acquired either from written instructions or demonstrations, but by actual experience. This being admitted, we may agree with Schreiber that "the necessary knowledge and skill can very well be mastered without an instructor, if, with each manipulation, the final end, namely, the physiological effect, be kept strictly in view," provided that this be confirmed and established by sufficient personal knowledge of pathological and therapeutical processes.

In his "Art of Massage" (translated, with notes, by Benjamin Lee, under the title of "Tracts on Massage"), Reibmayr has very much simplified the nomenclature and the multitudinous procedures of Ling and the French writers particularly. He distinguishes the following principal methods of application:—

1. **Introductory massage.**
2. **Massage proper.**

The divisions of massage are those of Mezger and his pupils, Berghman and Helleday, and are now generally adopted by scientific writers and practitioners:—

1. **Stroking.**
2. **Friction.**
3. **Kneading.**
4. **Percussion.**

1. **Stroking** is done with the whole palm, with the radial border of the hand, or with the thumb or ends of the fingers. The pressure may be as light as possible, and vary gradually from this to as much weight as can be borne, the operating hand being reinforced by pressure made upon it with the other, or the weight of the upper part of the body may be called into play to give sufficient force to the stroke. The direction is nearly always venous (centripetal, or toward the heart), but in rare cases it may be arterial (centrifugal, away from the heart).

2. **Friction** consists in more or less forcible, circular rubbing of a

surface, with the palm of the hand usually, or with the fingers or final phalanx of the thumb. During the manipulation the remaining fingers of the hand, or, it may be, both hands, clasp the limb which is under treatment, making it a point of support. It is advisable to begin at the border of the pathologically altered tissues, and work out the exudate into the surrounding healthy tissue in all directions, always concluding, however, with centripetal strokings.

3. **Kneading.**—This is what is meant by "massage," which, however, as an English word, is now used, in a comprehensive sense, to include all the manipulations employed in manual mechanotherapy, and is applied to such treatment, even though kneading proper be not included in the prescription. The restricted application of this term is to the method of picking up or grasping a certain portion of muscle or other tissue with the fingers of one hand and subjecting it to pressure between them, or upon a hard substance, such as a surface of bone. Dr. Douglas Graham, of Boston, who is especially skilled in massage, recommends that, in kneading, "each group of muscles should be systematically worked upon, and, for this purpose, one hand should be placed opposite the other; or, when the circumference of the limb is not great, one hand may be placed in advance of the other, the fingers of one hand partly reaching on to the territory of the other, so that two groups of muscles may be manipulated at the same time, with grasping, circulatory, spiral manipulations, one hand contracting as the other relaxes, the greatest extension of the tissues being upward and laterally, and on the trunk, forearms, and legs, away from the median line. . . . It is well, first, to go over a surface gently and superficially before doing the manipulation more thoroughly and in detail." For instance, to take up a limb of considerable size, such as the leg, he finds three divisions of surface necessary: the posterior and lateral aspects will form one; the stretching of the perineal muscles from those of the anterior tibial region will make another; and for the third a rolling of the tissues will be made away from the crest of the tibia. "In large muscular masses we seize them, in successive portions, with both hands, and squeeze in all directions, as one would squeeze water out of a sponge," says Reibmayr. At the moment of making pressure a certain amount of longitudinal traction may be practised, which adds to the value of the manipulation. Another, but much less effective, form of kneading consists in rolling the limb between the palms of the hands. The movements here are very rapid and pressure is less important, the principal effect being produced by the frequently recurring stretching and forcible separation of the individual muscles, fasciæ, and nerves. Dr. Benjamin Lee judiciously sums up the characteristic features of this method in the following words: "Kneading is the procedure by means of which, above all others, we act upon the circulation of the deeper-seated tissues and profoundly modify the processes of absorption, assimilation, and destruction; in short, of tissue-metamorphosis,—in other words, of life. Hence, our aim should be, to as great an extent as possible, to avoid allowing any motion between the hand and the surface of the skin,—that is to say, friction or stroking,—and to compel the integuments following the motion of the hands and fingers to describe the desired movements over the underlying tissues.

We thus not only act upon the circulation of the blood in the muscular and visceral capillaries, but accomplish the very desirable objects of increasing the elasticity of the skin, opening the areolar lymph-spaces, sundering pathological adhesions between the inferior layer of the skin and the tissues beneath, and stimulating the flow of the areolar fluid. Just to the extent that we allow rubbing do we lose the essential virtues of kneading."

**Vibration** is a form of massage, the alternate pressure and relaxation being made with great rapidity. It is generally performed by means of a mechanical contrivance, by which any portion of the body or limbs may be thrown into vibrations at a rate of several hundred per minute.

4. **Percussion** may be performed either with the border of the hand, the tips or knuckles of the fingers, the closed fist, or with some instrument constructed for the purpose. The shocks should be rapidly, but not forcibly, delivered,—usually from the wrist only. For this purpose various instruments have been invented, such as Bennett's percussion-hammer,Granville's percuteur, or electrical percusser; also, Klemm's or Ruebsam's muscle-beaters. The latter are useful for self-flagellation, but the hand remains the best instrument for accurately controlling the amount of force exerted. After massage has been performed **active and passive movements** of the neighboring joints are usually resorted to, especially in case of diseased joints and in chronic cases with stiffened articulations. In the north of Europe massage has been systematically combined with Swedish remedial gymnastics (so-called movement-cure) with great advantage. In this method various kinds of gymnastic exercises are resorted to, and peculiar forms of apparatus are provided to meet various requirements of treatment.

**Electro-Massage.**—A massage electrode, in the form of a small roller, affords an excellent means of combining the effects of electricity and massage. It is usually connected with the faradic apparatus, but in cases of paralysis or of exudation it might be very advantageously used with galvanism. Owing to its powerful effects this form should be applied personally by the physician, or, at least, it should be used in his presence and under his direction, in order that the rules already laid down for the administration of electricity shall be duly observed.

The Roman bath is the term used to denote the use of some unguent, such as cocoanut-oil, codliver-oil, or butter, in conjunction with massage.

**Physiological Effects of Mechanotherapy.**—As might be inferred from the above description of the methods of massage, its physiological effects are very obvious, though complex. They may be considered as mechanical, thermal, electrical, and vital; the latter term being applied to the force or forces which resist disease and oppose death. The mechanical effects are immediate and most important. Under the movements there is a stimulation of the exchange of cell-contents, an increased activity in the movement of the areolar fluid, and noticeably in acceleration of the blood-currents and contents of both blood-vessels and lymph-channels. The glands behave in a similar manner, although they are unaffected by mild electrical currents; "every mechanical impression, such as stroking or pressure, whether over healthy or inflamed glands, causes the escape of large quantities of contained lymph." Von Mosengeil injected a thick solution of finely-levigated, black, India ink into various joints in rabbits. Some were treated by massage; others were let alone for control experiments. Upon subsequently killing the animals, "In the cavities of the joints which had been kneaded no trace of India ink was found, while in those which had not been so treated, it was observed in considerable quantities, mixed with synovia. On examining the thighs, numerous and widely-scattered deposits of India ink were found in the areolar tissue in those limbs which had been manipulated. These were entirely wanting in the others. . . . Well-marked deposits of the coloring matter were discovered in the intermuscular connective tissue. The crural muscles were also stained black. The thighs of the unmanipulated limbs were not in the least colored, the muscles being of a clear red. The glands of the manipulated extremities which were situated above the joints were stained intensely black, and the lymphatics leading to them could be detected by the naked eye as two black cords. In the untreated limbs ink deposits in the lymphatic system were entirely wanting." Similar conclusions are drawn from the results of Jawadski's experiments upon dogs. It was found that massage made in the direction of the heart accelerated the absorption of liquid substances introduced beneath the skin, and that it considerably increased the effects of those substances. The rapidity of the absorption during the massage does not depend upon the quantity of the injected liquid. Absorption is, therefore, stimulated by massage, and this holds good in the synovial lining of joints as it does elsewhere, the process taking place principally through the lymphatic vessels. In the blood-vessels stroking and kneading caused increased rate of blood-movement; this being assisted in the veins, as also in the lymphatics, by the pressure of valves in the inner walls. Randolph and Dixon* found, upon examination of the fæces of persons receiving inunctions of codliver-oil with massage, that there was a notable increase of fat in the discharges, thus proving absorption of the oil in 80 per cent. of the cases.

The temperature of a limb, and very commonly of the whole body, is slightly increased by massage. Arrested motion and friction give rise to thermic effects in the body as in the physical laboratory. Owing to physiological causes, the whole of the heat thus developed in a body under massage treatment is not made manifest by the thermometer, but is probably transformed into other forms of energy, such as electricity or cell-force. Heat, electricity, chemical action, motion, and life-force are intimately connected, and experiment and observation prove that properly-directed massage elevates temperature and improves nutrition, partly mechanically and partly through increased cell-activity. The vulgar notion that the operator directly transfers electricity or so-called animal magnetism from his own body to that of the patient has no other basis than this: Although a certain class of operators make capital for themselves by pretending to confer health or magnetism, their claims are either due to ignorance or to a deliberate attempt at deception. What passes from the operator to the patient is motion and, to a slight degree, heat. The operator feels the result of exercise of his muscles and becomes fatigued, not because he has parted with any mysterious force, but simply because massage is rather hard work.

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* Transactions of the College of Physicians of Philadelphia.

Schreiber divides the physiological effects into two groups:—

1. **Primary** (purely mechanical) effects, *i.e.*, the removal of lymph, exudations, transudations, and extravasations; the destruction of exudations by pressure, the removal of vegetations by friction, and the solution and removal of adhesions.

2. **Secondary effects,** which act by increasing the circulation by stimulating the muscular and nervous systems, by setting up molecular changes, and producing consequent changes in sensation, and by effecting alterations in the process of general nutrition.

**Pain in an inflamed area** being caused by the pressure of some exudation upon sensory nerves, relief will be produced by removal of this pressure under the effects of mechanotherapy. **Analgesia** is, therefore, obtained by massage. Inasmuch as manipulation causes an onward flow of the contents of the lymphatics and blood-vessels, massage has an **antiphlogistic action.** This is further demonstrated in its power of causing resorption of inflammatory products. It may also be regarded as an **alterative** on account of its effects upon effused fluids and its power of restoring healthy action in diseased parts. It is likewise a local **stimulant** and **counter-irritant.**

Neuralgia, or pain unaccompanied by inflammation, is usually the result of some lowering of the general nutrition, or the effect of a poison such as malaria. It may or may not be associated with any local lesion which acts as an irritant. Massage is especially serviceable in the first class of cases, owing to the improvement of local and general nutrition; but any source of irritation—such as eye-strain, caries of teeth, indigestion, etc.—should receive attention and be corrected if possible. The secondary effects of massage are included under the general heads of stimulation of vaso-motor nerves and arterioles, with, in consequence, increased absorption and nutrition, and muscular contraction with increase of heat. Mechanical stimulus bears a strong resemblance to electrical stimulus in its effects upon the human body. According to Schreiber, "Any source of energy conveyed to a nerve from without first expends itself in producing molecular change, and this is again converted into energy, manifesting itself through the various forms of innervation." Hence, it follows that, as far as its effects upon the nerve-tissue are considered, it may be regarded as identical with electricity, with certain limitations. The proper appreciation of this is of much importance in mechanotherapy and is of daily practical application, especially in the treatment of neuralgia. The normal functional activity of the nervous system, according to Heidenhain, Hallstein, Tigerstedt, and others, consists of a species of wave-motion. The communicated motion or stimulus is converted, in some unknown manner, into the form of motion peculiar to nerve-substance. How molecular change is transformed into nervous force is a physiological problem which has not yet been solved; but this hypothesis of Tigerstedt is at least plausible, that nervous energy itself is a form of wave-motion among molecules, and analogous, therefore, to light and heat. Douglas Graham sums up the action upon the nervous system in the following enthusiastic terms:

"Upon the nervous system, as a whole, massage most generally exerts a peculiarly delightful, and at the same time profoundly sedative and tonic, effect. While it is being done, and often for hours afterward, the subjects are in a blissful state of repose; they feel as if they were enjoying a long rest, or as if they had just returned from a refreshing vacation, and quite frequently it makes optimists of them for the time being. An aptitude for rest or work usually follows, though generally those who submit to this treatment feel gloriously indifferent, and needless apprehensions are dispelled. I have never known anyone to take cold or suffer from exercise in the open air after general massage when ordinary care was observed. . . . Through the medium of the central nervous system even local massage is radiated or reflected throughout the body, thus acting at the same time as a nervous and vascular revulsive, or physiological counter-irritant, if one may be allowed the expression. One of the best examples of this, perhaps, is the relief from headache from manipulation of the back and shoulders. It has long been known that stroking the limbs often induces sleep. . . . The transmitted and reflected influences of massage must evidently be as numerous as the distributions and connections of the sensitive nerves that are accessible to its impression. Briefly, it may be said to act on distant parts by sympathy, by reflex action, and, as a variety of the latter, by inhibition." "Furthermore, massage excites and awakens the **muscular sense** in an agreeable and beneficial manner, such as nothing else does, restoring idiomuscular contractility and extensibility; and we know that the state of our muscles indicates, and often determines, our feelings of health and vigor or of weariness and feebleness." Estradua* sums up the effects of massage in similarly enthusiastic expressions of opinion. "I think that this happiness, this quietude, this respiration more free, these ideas so pleasing, are the result of the equilibrium which at this time reigns over all the functions. The nervous system, no longer requiring to exert herself against obstacles to respiration, to circulation, and to nutrition, enjoys a tranquillity almost equivalent to repose, and then this state of oblivion, *de la vie expectative*, in some manner leaves the imagination to dwell upon the ideas of beatitude which come in multitudes to occupy the nervous centres, and these now have no need to concentrate a certain part of their activity to control the functions,—to subdue some and to stimulate others."

Massage is the hand-maid of medicine, in a literal sense, since the absorption, diffusion, and assimilation of remedies is favored by general massage,—at the same time that the emunctories are stimulated and the excretion of effete material by all the channels of excretion is encouraged.

**Therapeutic Applications.**—At the present day no physician can be considered well equipped for his duties unless he is acquainted with at least the fundamental principles of massage, and understands how to apply them in practice. It is by no means necessary that he should himself be an expert in the art of massage,—although this would be a consummation devoutly to be wished for his patient's sake,—but he should know how to prescribe massage as intelligently as he prescribes medicine, and should know whether or not the work is properly done, so that his patient may receive the greatest amount of benefit. It is too often the case that massage is "tried" in a case, and left entirely to some amateur masseur, who lacks tact and experience, and, after one or two *séances*, it is abandoned, and massage is brought into discredit. The physician owes it to himself and to his patient to see that the treatment is properly administered, and carefully adjusted to the strength of the patient. Some cases are benefited by ten minutes of massage, but would be completely exhausted by the full hour, which is the usual standard of service rendered among the lower class of operators. The golden rule in massage is, that the operations should be conducted in such a manner and for such a period of time as will afford the greatest benefit to the patient, without being followed by any sense of fatigue; but, on the contrary, as stated on the preceding page, he should feel rested and invigorated after each treatment.

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* Quoted by Graham in his Practical Treatise on Massage. Wm. Wood & Co., New York, 1884, p. 79.

**Neurasthenia and Hysteria.**—Massage occupies an important place in the so-called "rest-cure" of Dr. S. Weir Mitchell. It must be remembered that the subjects for this combined treatment of physical and mental quietude, diet, electricity, and massage, are either broken-down, chronic invalids or hysterical subjects, whose energies apparently are in a state of hibernation, or, at all events, in an abnormal condition as regards their response to the requirements of the mind and the body. Such patients are too weak for bodily exertion, often paretic, certain groups of muscles being affected more than others; there may be, and often is, great emaciation, due to want of exercise, and frequent pains and aches, owing principally to deficient nourishment of nerves and defective innervation of organs. Cases which have been bedridden for years have been cured by Mitchell, Playfair, and others, by enforced rest, improved nutrition, and electro-massage. The physiological factor in the Weir-Mitchell treatment is certainly a valuable adjunct. He insists upon isolation of the patient, forbidding all visitors, especially members of the family, absolutely confining the patient to the company of the nurse and the doctor, during the period of treatment, and, in some cases, even interdicting all private correspondence. "**Rest,**" says the author of this treatment, "means with me a good deal more than merely saying, 'Go to bed, and stay there!' It means care that letters bring no worrying news; that they are brief, and of such kind as a nurse may read aloud. It means absence of all possible use of brain and body. It means neither reading nor writing, at least for a time, with exceptions in cases where, as is rare, there is no asthenopia. If the nurse can read to the patient, and reading be borne without fatigue, let it be used, at first, for only a few minutes at a time. If this wearies, then let the nurse try to cull the bits of interesting news from the papers, and, as she glances over the columns, talk this to the patient in place of formally reading aloud. . . . If you are disposed to smile because I say let the nurse feed the patient, you will not if, lying supine, you make the experiment of using your own hands in the act of feeding. . . . I believe that I have done something to make rest fashionable among physicians as an essential to the treatment of spinal maladies, and, both in them and in the treatment of neurasthenia and hysteria, it is well that you clearly comprehend what it is that I mean by rest. Your trouble will be, always, that the patient will desire to lie on a sofa, or to make some such compromise, but in bad cases—and it is only of these I speak—all this is but mere trifling, and you had better, on the whole, make an error in the direction of a too absolute rest."* The fact is, that in many of these patients there is a long history of domestic tyranny by the querulous and exacting invalid, and the first battle to be fought is to establish the authority of the physician. Unless he can secure an unconditional surrender, so as to be master of the situation and have his directions obeyed, both in letter and spirit, he had better retire from his charge of the case, and refuse to accept any responsibility as to the results of treatment, in order to protect his own reputation. After he has secured the co-operation of those in authority, he is in a position to dictate the plan of treatment. The rest-cure consists essentially in keeping the patient passive, in the recumbent posture, for a certain length of time, —generally about three months,—keeping up nutrition by frequent feeding and the daily application of electricity and massage. The moral influence of the association with the trained nurse is of great advantage to the patient, as is also the knowledge that the term of treatment depends altogether upon the rate of improvement. In many cases this knowledge and the irksomeness of unaccustomed restraint combine to awaken an ardent desire to get well, which has a very happy effect upon the results of the treatment.

**In hysterical paralysis, whether monoplegic or paraplegic**, or in **hemiparesis**, the treatment by rest and massage, as above indicated, is of the greatest service, although in the lighter cases it may not be necessary, these being the patients who are likely to be benefited by the static current. Weir Mitchell, in the work already quoted, warns against allowing a convalescent, hysterical, paralytic patient to overtax her strength, or the original difficulty may return in an aggravated form. As regards the dietetic treatment, this is not the place for its discussion, but it is proper to observe that many fat patients are really thin-blooded and anæmic, and the first step toward improvement is a decline in weight. Mitchell reports one case of a paraplegic woman, weighing one hundred and seventy pounds, who was put to bed and allowed a milk diet mixed with a little rice-water or barley-water, the milk being gradually reduced to less than a quart a day ; when she showed signs of weakness beef-soup was added to the diet for a day or two. In one month, under this regimen, her weight was reduced some twenty-four pounds. Massage and induced currents, with a good diet, now turned the scale ; she gained in color and in flesh, and at the end of another month she could walk without much trouble.

Dr. Benjamin Lee points out a possible abuse of the rest-cure, and considers that the treatment in other hands than the author's is capable of producing injury rather than benefit. He regards the movement-cure as the essential agent in the restoration of these nervous invalids, and the enforced rest, apart from its influence upon the *morale* as a means of subduing the perverse will of a spoiled child, simply as an accident of the massage and the acto-passive exercise necessary, to a certain extent, to reap the full benefit of the method, not necessarily remedial in itself, and, without the other means, as likely to do harm as good. **Overfeeding**—which is insisted upon—is only made possible by the mechanical treatment, and, in its effects, may really be undesirable and pernicious, by overloading the emunctories to a degree entirely beyond their capability to take care of assimilated material forced upon them in order to build up adipose tissue. It is possible that this fat may be deposited in abnormal situations, as in the liver or in the walls of the heart. He holds that, in these cases of impaired nutrition, hydrated blood, degenerated tissue, and depressed nerve-force, our object should not be to overload the economy with carbon and lay on layer after layer of adipose tissue, but to create a demand in the tissues farthest from the centre for healthy blood, by breaking down and forcing out the dead-alive cells, with their accumulations of morbid deposit, and sending them to the emunctories to be excreted, and, as this demand begins to be felt, supplying it cautiously,—principally with nitrogenous elements,—and not in excess of the assimilating organs to manage it. It is evident that the results of the so-called rest-cure will not be equally good in the hands of all who attempt to carry it out, and, where it is practised, the greatest attention should be given to all the details in each individual case.

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* Lectures on Diseases of the Nervous System, especially in Women, page 227. Philadelphia, 1881.

**Massage in General Medical Practice.**—**Headache** due to hyperæmia is relieved by neck-massage,—stroking the tissues upon each side of the larynx and trachea downward, thus accelerating the venous current in the numerous superficial veins. Its operation is analogous to that of blood-letting upon the cerebral vessels; the stroking, therefore, should be gentle, especially at first, and not too frequently repeated, or it may cause syncope. Massage of the muscles of the back, also, often relieves headache. **In congestion of the brain or membranes,** whether active or passive, the intra-cranial circulation may be diminished in this way, preparatory to the employment of slower derivative agents, such as purgatives. **In sun-stroke** Reibmayr is so convinced of its good effects that he says it should always be instantly resorted to. **Hemicrania,** of the congestive form, may be relieved promptly in the same manner. In the anæmic form of **hemicrania,** or **migraine,** massage of the neck does no good; but firm stroking of the frontal and temporal regions, with the eyes closed, usually brings relief. As such patients are readily hypnotized by gentle stroking of the head, this method should be employed with circumspection, unless it is desired to produce hypnotic sleep. **Nervous headaches** and some neuralgias are benefited by stroking and friction. Norström, of Paris, finds neuralgias of muscular origin, which are accompanied by centres of induration in the muscles of the neck, and often by tenderness along the nucha. These he attributes to chronic inflammatory processes, and that the removal of their indurations by massage is invariably accompanied by complete cure of the neuralgia.

In **tabes dorsalis,** or locomotor ataxia, good results have been reported by Schreiber and others following the use of massage. The annoying symptoms of this disease are undoubtedly relieved by mechanotherapy and the progress of the morbid lesions possibly delayed; but it cannot be said as yet that the therapeutic problem in this interesting malady has been solved.

It is in **sciatica** especially that the most brilliant results have been reported from the movement cure. In sciaticas of rheumatic origin strong stroking alternating with percussion along the course of the affected nerve is usually successful in producing a cure in a short time. If pathological changes in the course of the nerve have caused the sciatica, the success of the treatment will depend upon their discovery and their removal, either by local massage or by other means. When tumors, or pathological changes deep within the pelvis, have caused the pain, massage may fail and, in fact, may aggravate the suffering. In uncomplicated cases cure may be hastened by combining massage and electricity. Painful points, especially along the spine, are frequently met with, especially in women. As such points are in some cases the point of departure for hysterical or epileptiform convulsions, it is important to relieve or remove them early by local massage.

In various neuroses of occupation, professional neuroses, of which **writers' cramp** is a familiar illustration, massage is the only agent capable of affording permanent relief. The method of Wolf in treating writers' cramp has already been mentioned under Electricity; it is a combination of stroking and friction, with both the galvanic and faradic currents. In cramp of the calf of the leg, the toes should be strongly adducted, so as to twist the muscle, while friction is applied with the palm of the hand.

**Chorea** is a disease which is rapidly controlled by massage and gymnastics, as pointed out by Blache and Bouvier.* The treatment is by light stroking of both upper and lower extremities and the chest, the patient being held by attendants. The muscular masses of the back, especially at the neck and along the spinal column, are also masséed. The treatment, lasting for about an hour, should be repeated daily for three or four days. "After each treatment the irregular muscular contractions become less violent, and the patient gives it to be understood that he feels more comfortable. Sleep, which had been completely interrupted during the continuance of the most violent contractions, is gradually re-established, and speech begins to return. For several subsequent days the light stroking and friction must be persisted in, and the masseur may then begin very regular rhythmical, passive movements." Following these, acto-passive movements are encouraged for the next eight or ten days, when the patient may be encouraged to try to walk alone. As soon as he is able to accomplish this, active gymnastic exercises of simple character are superadded. By systematic training and encouragement the control of the will over the muscles is gradually established, while at the same time there is an improvement in the chlorotic condition, and the heart and arterial murmurs disappear. This method of treatment, according to its originator, Dr. Blache, is not followed by relapses, and the patients apparently are permanently cured.

In **rheumatic paralysis**, or peripheral paralysis of a motor nerve as a result of exposure to cold, and also in **lead paralysis**, massage is an invaluable adjunct to the electrical and other treatment, and a tendency to degeneration of the muscles and nerve may thus be overcome.

In **infantile spinal paralysis** and **club-foot due to paralysis**, massage, systematically practised, improves nutrition of the parts and is often curative if early resorted to. Erb considers it of service as an adjunct to electrical and other forms of treatment. It is often impossible for parents to bring their children to be treated daily with electricity, and they can be taught by the physician to employ massage at home. In **central paralyses** the nutrition and circulation of the palsied parts can at least be improved by massage.

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* Use of Gymnastics and Massage in Chorea. Dr. Blache, Paris, 1854.

Dr. Murrell reports a case of recovery from **chronic** myelitis in a man 35 years of age, as the result mainly of massage.

In **acute catarrhs** of the mucous membrane of the upper air-passages, in **coryza, tonsillitis, pharyngitis, angina, laryngitis,** massage of the neck is highly serviceable. In **croup** Weiss employed this method with remarkable success. In a child with croup a single sitting relieved the most urgent symptoms; the short, wheezy respiration, accompanied by the most painful tension of the respiratory muscles, soon became more free, easy, and deep; the aphonia gave place to a voice which, although still hoarse, was no longer mute, and the child became more tranquil and willingly underwent the massage, inasmuch that it brought him such manifest relief. **Bronchial catarrhs, asthma of the pure nervous type,** and even **angina pectoris** are benefited by stroking, friction, and percussion with the palm of the hand until the skin becomes intensely reddened. In eleven cases of dry and sero-fibrinous pleurisy Polakow observed favorable results from massage of the chest, though in suppurative cases it is contra-indicated. During the treatment the effusion was rapidly absorbed.

In **torpid liver, semi-paralyzed condition of the intestines,** and **constipation,** abdominal massage is capable of accomplishing much toward overcoming the morbid state. As stated by Reibmayr,* we shall bring it into use in all those affections in which we desire to regulate the peristaltic movements of the stomach and bowels; to exert a favorable influence on the circulation of the blood and of the lymph so closely dependent upon those movements, and hence, secondarily, on the secretion and excretion of the digestive juices; to expedite the absorption of exudations, and, finally, to dislodge obstructing fæcal masses in the intestinal tube by direct mechanical action. Massage may, therefore, be practised in **acute** and **chronic gastric** and **intestinal catarrh, dyspepsia, cardialgia, dilatation of the stomach, intestinal obstruction** (**ileus**), **tympanites** not dependent upon inflammation of the peritoneum, **ascites,** and finally, all the sequelæ of peritoneal inflammation,—such as firm peritoneal or extra-peritoneal exudations, swellings, and adhesions,—always provided that the inflammatory process is completely at an end. All inflammatory affections of the peritoneum, malignant tumors, and deep ulcerations of the stomach or intestines contra-indicate its employment. "For **habitual constipation,** especially in persons of sedentary habits, abdominal massage, combined with pelvic gymnastics, constitutes the most desirable, sure, and efficient remedy that we possess," in the opinion of Benjamin Lee. Constant moderate pressure has an analogous action. Dr. Feilchenfeld has successfully made use of a cushion containing three or four pounds of shot included between layers of wadding.

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* Tracts on Massage. No. iii. Translated, with notes, by Benjamin Lee, Philadelphia, 1887.

Thus an equable pressure is maintained. The cushions are held in position by tapes and, as a rule, an hour or an hour and a half of this application is sufficient to bring about a movement of the bowels.

In **hepatic congestion with jaundice** local massage over the liver with general abdominal massage for fifteen minutes daily are used, combined with gymnastic exercises for pelvic muscles.

**Chlorosis** and **anæmia,** as recently suggested by Sir Andrew Clarke, are often associated with and dependent upon constipation. Abdominal massage to overcome the latter condition, combined with general massage of the entire surface, will render most favorable results.

In **local œdemas** and **congestions** stroking, friction, and passive movements are rapidly curative.

**Rheumatic gout**, or, more correctly, **chronic rheumatoid arthritis,** is, according to Dr. Graham, amenable to massage, provided that the treatment commence before the pathological changes in muscle, tendon, bone, and surrounding tissues are too far advanced. Frequent visits and arduous work are required, but in the end amply repay both physician and patient for the time and trouble expended. He obtained gradual improvement from the use of massage in five out of six cases of well-marked rheumatic gout; and, by keeping up the treatment, four patients regained tolerable use of the affected limbs, and in one recovery seemed to take place. Berghman and Helleday, Courfield, Balfour have reported cases similar to those of Graham, where marked improvement resulted from the treatment. His method was deep manipulation, without friction or inunction; passive motion as far as pain would allow, and sometimes farther; and resistive motion as soon as it could be done. . . . If pain last for several hours, and increase after subsequent efforts, the treatment must be modified or suspended. Kneading with one hand, so as to break up indurations or disperse effusions, while the other hand pushes along the circulation in the veins and lymphatics above the joint, will often lead to absorption of products not too firmly organized. Massage of the adjacent area acts as a physiological derivative, and improves nutrition. The inutility of any other form of treatment makes massage the only resource in this disease.

In **heart disease,** when valvular disease has resulted in insufficiency and the compensatory hypertrophy is commencing to fail, at a time when there is slight œdema, fullness of the venous system, symptoms of hyperæmia of the liver, etc., general massage affords marked relief. The œdema disappears, the circulation improves, and the digestive organs perform their duties in a more satisfactory manner under the influence of properly-applied massage.

In **weak heart,** due to deficient innervation or to lowered tone in the muscular tissue, following certain fevers, such as typhoid, influenza, diphtheria, etc., the daily performance of general massage, with passive exercises, will gradually restore vigor and tone to the debilitated organ.

In **diseases of women** massage, on account of its corroborant power, is a valuable emmenagogue. It diminishes the suffering attendant upon dysmenorrhœa, and may be instrumental in restoring such normal relations as will overcome sterility. In malpositions and flexions of the uterus, with or without prolapse, the application of pelvic massage after the plan of Thure Brand, of Stockholm, has proved very successful. It consists in (1) raising the womb; (2) massage of the organ and its ligaments; (3) forced abduction and adduction of the knees; (4) percussion of the lumbar and sacral vertebræ. This method favors absorption of exudations, cicatricial bands, adhesions, etc., and was indorsed by A. Reeves Jackson, of Chicago. With regard to the correction of womb troubles, Weir-Mitchell offers the following rules in connection with the rest-cure: "In the case of married women I make, or cause to be made. a thorough examination, to begin with. If there be only congestive states and their consequences, I trust to the general treatment for cure. If there be marked displacements or excessive menstruation, I like to correct the one and have the uterus well searched for possible causes of the other. Should there be grave fissures of the neck of the womb or perineal rupture, I prefer to have them relieved at once. Misplaced ovaries cause, in my experience, a great deal of trouble, but both Professor Goodell and I have seen a number of cases in which this annoying complication righted itself spontaneously during treatmeut by rest."

Keyes, Thure Brandt, Eberman and others have beneficially employed massage in affections of the prostate gland. The method is practised by means of the index finger introduced into the rectum. The bladder having been previously emptied, pressure and friction are made upon the gland, pressure being made in a direction toward the pubis and bladder. These manipulations are thought to promote absorption of pathological products by the lymphatics and blood-vessels. The method is unsuitable to acute prostatitis, but may be advantageously employed in the declining stage. If suppuration occurs massage is a serviceable procedure after the abscess has been opened. The method is of special value in chronic prostatitis associated with swelling and in soft, uniform hypertrophies of the gland.

In **skin diseases** extended experience has only confirmed the favorable opinions expressed by the author in 1884, in papers which he read before the section of Dermatology and Syphilis of the Eighth International Medical Congress, at Copenhagen, and before the American Medical Association (1883), on "Mechanical Remedies in Skin Diseases," as to the practical value of massage in this special field. He regards it as one of the most helpful agents at his command. To consider a few of its applications, we may commence with seborrhœa capitis. Gentle massage is here of great service in restoring perfect capillary circulation, promoting absorption, and imparting a healthy tone to the tissues. It prevents falling out of the hair, and favors a healthy new growth by improving the nutrition of the hair-bulb. In **acne indurata** and in glandular swellings in the skin, massage opens the clogged absorbents, causing the lesions to disappear and rendering the skin soft and elastic. Many skin disorders are the result of disturbed digestive processes and constipation, and the application of massage to the abdomen, by kneading and percussion, is of excellent service in removing the cause of the unhealthy condition of the skin. Excess or deficiency of pigment may be remedied by massage, owing to its dispersing power and tendency toward restoring normal action. In **psoriasis** and **scrofuloderma,** general massage is used to increase nutrition of the skin and promote the formation of blood-corpuscles and consequent oxidation. In the **itching** of chronic or acute eczema, massage is directly beneficial, and patients may be instructed to use it in place of scratching with the nails, which produces secondary lesions and aggravates the original condition. Many **trophic disorders** of the skin are influenced favorably by properly-administered movements.

**Infiltration of the skin,** accompanied by roughness and scaliness, is a condition in which ordinary methods fail, but which will yield to massage. In simple cases of rough, thick, and leathery skin, where it is desired to enhance the beauty of its texture, its fairness, softness, and elasticity, there is no agent so powerful as massage. Frequent warm bathing, an occasional Turkish bath, and daily shower baths are very valuable in stimulating the cutaneous circulation, and should be supplemented by friction and kneading. The well-recognized benefits of friction with a coarse towel are feeble imitations of the results of skilled massage, such as gave suppleness to the muscles and health and beauty to the skin of the ancient Greeks.

Massotherapy is the best means in our power for rendering old, infiltrated, exudative material amenable to the action of the absorbent vessels. In **elephantiasis arabum** deep kneading has led to excellent results. In the intervals of the application the limb may be compressed by a bandage, preferably of rubber. Very decided diminution of bulk has followed this treatment. **Ecchymoses** of the face or other parts of the body, due to bruising and consequent effusion of blood under the skin, are very disfiguring for the time; they may be rapidly dispersed and absorbed by rotary friction, stroking, and gentle kneading. **Hæmatoma** of the auricle, frequently occurring in the insane, is believed to arise frequently from direct injury. At all events, it gives rise to considerable deformity, and should be treated with massage applied in the same manner. In **furuncle,** before suppuration has occurred, gentle friction—first of the neighboring vascular area and finally of the lesion—will relieve pain and promote resolution. The pain of **herpes zoster** is said to be decidedly lessened by well-directed local stroking over the affected nerve. In **hyperidrosis** and other disorders of the perspiratory glands good results may often be noticed after general massage, and the consequent improvement of the general health. In **sycosis** we have had excellent results from general massage combined with local measures. **Ecthyma** being an expression of faulty nutrition, massage similarly promises good results by improvement of the general condition. **Impetigo** is similarly caused and similarly benefited. In **lichen planus** and **lichen scrofulosus** massage is of service, and it is calculated to counteract the constitutional depression attendant upon **lichen ruber.** **Scrofulous** and **syphilitic lesions** of the skin, especially occurring in weak patients or those of feeble constitution, or debilitated by intemperance, sexual excess, insufficient food, poor clothing, and bad air, are rapidly benefited by general massage and proper hygienic management. **Cicatrices** and **hypertrophied scars** may be softened and caused to disappear by persevering applications of friction and kneading, especially if codliver-oil be used locally, by inunction, at the same time.

Morbid growths of a benign character, hypertrophied tonsils, chronically-enlarged glands may disappear under general and local massage; and inflammatory thickening and indurations very constantly are removed in this manner.

In **chloral poisoning, alcoholic coma,** or **opium narcosis,** as suggested by Dr. Murrell, massage of the extremities is useful in maintaining the circulation until antidotes have time to act. The therapeutical effects of vibration may be briefly alluded to in this place. The late Professor Charcot testified to its beneficial influence in paralysis agitans. The patient was seated in a specially devised armchair which, by a mechanism set in motion by means of electricity, was made to undergo rapid oscillatory movements. Dr. Gilles de la Tourette has applied a similar method to the head in megrim, insomnia, neurasthenia, melancholia, etc. His apparatus, which is made in two pieces, bears some resemblance to a helmet, and upon its top is placed a small electric motor. The motor produces a uniform vibration of 600 revolutions per minute.

**Synergists.**—Hygienic measures of all kinds assist massage in bringing the body to its highest state of physiological perfection. Pure air and exercise are powerful adjuncts; bathing, especially sponge and shower baths, are too much neglected; affusion, or pouring, of either hot or cold water, or each in turn, is a decided stimulant to the nerves and vessels of the part treated; and, in fact, massage is greatly aided in producing the desired results by these and similar means. Proper clothing, both at night and during the day, will assist the treatment. During massage the clothing should be loosened, or of such character as to permit the required manipulations. In the use of apparatus, as in the Swedish system of mechanotherapy, and, in fact, in the drill, either with or without appliances, a gymnastic suit of flannel, with a belt at the waist, is indispensable. Intelligent supervision should be given to the daily food of the patient, in order that the best results may be derived from the movement-cure. The diet should be plain, nutritious, and, unless in special cases where the contrary would be required, it should be sparing. The object to be kept in mind by the patient should not be the gratification of the palate, but the needs of the system. The advice to exercise not for strength, but for health, may be accompanied by the admonition not to eat for enjoyment of the pleasure of the table, but to keep the body well.

Electricity is closely allied to massage in its effects upon the muscular system, as it produces contraction and commotion in the body of the muscle by acting upon the muscular fibres and end-organs of the nerves. As previously indicated, a combination of these valuable agents is used by means of the roller electrode, using either faradism or galvanism. The hand of the manipulator may also be made to act as an electrode and communicate a current to the tissues operated upon. In delicate patients and children this is the best manner of administering electricity, as they are re-assured by the knowledge that the current must pass through the body of the attendant before reaching them. In the rest-cure faradic electricity is employed to produce contractions of individual muscles, and, in effect, it serves as a means of making passive motion. The massage is performed either before or after the application of the electrical current, but generally before.

Some drugs are of great value in assisting a course of massage. They would generally be classed as nerve-tonics and restoratives, but it is often necessary to regulate the action of the digestive organs and get them into a normal condition before getting the best results of the massage treatment. If digestion is feeble, it may be judicious to give digestive ferments for a time, until the improved nutrition enables the glands to secrete a better quality of gastric juice and other digestive fluids. Where the liver is performing its duties poorly, the administration of a good cathartic will hasten the effects of massage, and in cases of constipation the use of a large warm-water-and-soap enema, or the injection of a small quantity of glycerin into the rectum, will assist the manipulations in moving scybalous masses. At the same time, it is observed that cases of constipation which come for treatment by massage are generally those which have been through the list of purgatives, and pills and potions have lost their effect, owing to an atony of the bowel-wall or paresis of the nerves causing peristaltic movements. As already intimated on a previous page, feeding is to be regarded as of more importance than drugging, and a judicious regulation of the dietary will often make remedies superfluous, especially if abdominal massage be properly practised, in many disorders of digestion.

Tonic remedies proper or nerve-tonics, of which strychnine may be taken as a representative, have been greatly abused in the treatment of neurasthenic patients, who require massage and good hygienic treatment. Drugs very poorly substitute gymnastic exercise and fresh air. If patients should have their exercises regularly prescribed for them, and obey the directions of the experienced physician in regulating their periods of work and rest, the supposed necessity for tonics would often disappear entirely from the therapeutic problem. Owing to the great faith which patients have in the mysterious virtues of remedies and the power of habit, they do not feel satisfied unless they have a magistral prescription, and are taking the regulation "teaspoonful three times a day." It is, perhaps, a pardonable weakness, perhaps a shrewd and judicious procedure, to concede something to the prejudices of the patient and prescribe, if not a placebo exactly, at least a mild stomachic; something bitter,—but not too bitter,—that he may satisfy his sense of propriety with while he permits the massage and electricity to do their perfect work. The good results will be apt to be ascribed to the medicine, but as our object is to cure the disorder this undue exaltation of one part of the treatment must be suffered and ascribed to its proper source,—the ignorance of physiological processes on the part of the patient.

**Contra-indications.**—Many cases of confirmed invalidism have drifted into the habit of taking comparatively large doses of various narcotic remedies, with which they stupefy themselves, and thus pass their lives in a more or less intoxicated condition. It need scarcely be said that the use of drugs which lock up the secretions, benumb the nerves, and lessen motility of the muscles is entirely opposed to the objects for which massage is practised, and that such drugs must be abandoned if improvement of health is expected under mechanotherapy. Fortunately, as Murrell has pointed out, massage aids in overcoming the opium and chloral habits, and, if the patient wishes to escape from the physical and intellectual degradation which their constant use entails, no better way has been devised than a course of treatment of this kind. For many reasons, it is preferable that such patients shall be taken away from their friends and customary surroundings and treated in an institution directly under the supervision of the skilled physician in charge. The treatment must be mental as well as physical, and the first step to be taken is to secure the co-operation of the patient, and make him sincerely and earnestly desire to throw off the evil habit and to be restored to a normal state. If this be not secured the result will not be permanent, even if massage and gymnastics are faithfully performed, because a relapse will be inevitable as soon as the opportunity of indulgence is again presented. It is evident, therefore, that unless the patient pledge his honor to abstain in the future, massage will be only of temporary benefit and will be brought into undeserved disrepute.

While massage may relieve pain in carcinoma and other forms of malignant disease, it is considered inadvisable, since it favors the absorption of the cancer-cells and their introduction into the neighboring glands and systemic infection. In aneurism the suffering may be relieved by light friction, but kneading or pressure must be avoided. In ulcer of the stomach, massage should not be practised. It is considered injudicious, in atheroma of the cerebral arteries and in softening or tumor of the brain, to perform general massage; but gentle massage of the neck may be permitted, in order to assist the return of blood from the brain.

In recent apoplexy, hemiplegia, or monoplegia, and effusions into the spinal cord, it is better, for the first week, to abstain from massage. Subsequently, light friction may be used, in order to maintain nutrition of the limb by urging onward the lymph and blood in their respective vessels. If local softening of the brain should occur (red softening), anything like active or passive movements of the affected limbs should be avoided as completely as possible. In chronic myelitis it is generally considered that massage is of little value, but Murrell reports a remarkable case, which has already been referred to, in which it produced almost a complete restoration of motion in the paralyzed limbs. In recent neuritis the use of massage is interdicted, as the rule, although a skillful operator will be enabled to afford relief from pain and diminution of hyperæmia by progressive massage.

**How to Prescribe Massage.**—The usual method of prescribing massotherapeutics is to personally interview the masseur or **masseuse** (male or female operator), and indicate verbally, and, perhaps, by demonstration exactly the character and duration of the movements desired. This is the best way, because the physician can remain and see the operations performed, and have a demonstration of the manner in which his ideas are carried into practice. Where the physician has his own trained nurses, who fully understand his directions and can be trusted to carry them out, this inspection on the part of the physician may be dispensed with, as it involves considerable loss of time. For his notes of cases, it is also desirable that there should be some abbreviated form of indicating the exercises. In the German and Swedish works on mechanotherapy these directions are given in terms which, to the uninitiated, are entirely meaningless, especially in the system of Ling and his immediate followers. Instead of indulging in such an expression as this, for instance, "Left — rest — right — extended — gait—left—side—support—standing," it would greatly simplify the matter if a code of arbitrary signs were adopted, as in the transmission of messages by the Atlantic Cable. For instance, in regard to massage, the nurse may be supplied with a card, on which may be printed the following :—

### No. 1.—Massage.*

| | | |
|---|---|---|
| A. | All over, | 30 minutes. |
| B. | All over, | 45 “ |
| C. | All over, | 60 “ |
| D. | Head-massage, | 5 “ |
| E. | Over the chest, | 5 “ |
| F. | Over stomach and bowels, | 5 “ |
| G. | Over the throat, | 3 “ |
| H. | Over the spine, | 5 “ |

### No. 2.—Fomentations, with Wet Compresses.

| | | |
|---|---|---|
| A. | Hot on back of neck and head, with ice-cold compresses over nose, | 15 minutes. |
| B. | Hot between shoulders, with ice-cold compresses over lungs, | 15 “ |
| C. | Hot between shoulders, with ice-cold compresses over lungs, | 20 “ |
| D. | Hot between shoulders, with ice-cold compresses over lungs, | 30 “ |
| E. | Hot behind stomach, with ice-cold compresses over bowels, | 20 “ |
| F. | Hot behind stomach, with ice-cold compresses over bowels, | 30 “ |
| G. | Hot on sacrum, with ice-cold compresses over bladder, | 20 “ |
| H. | Hot on sacrum, with ice-cold compresses over bladder, | 30 “ |

### No. 3.—Fomentations, Alternating with Compresses.

| | | |
|---|---|---|
| A. | Alternate hot and cold, four changes, to dorsal vertebra, | 15 minutes. |
| B. | Alternate hot and cold, four changes, to dorsal vertebra, | 20 “ |
| C. | Alternate hot and cold, four changes, to dorsal vertebra, | 30 “ |
| D. | Alternate hot and cold, four changes, to lumbar vertebra, | 15 “ |
| E. | Alternate hot and cold, four changes, to lumbar vertebra, | 20 “ |
| F. | Alternate hot and cold, four changes, to sacrum, | 15 “ |
| G. | Alternate hot and cold, four changes, to sacrum, | 20 “ |
| H. | Alternate hot and cold to cervical vertebra, | 15 “ |
| I. | Alternate hot and cold to cervical vertebra, | 20 “ |
| J. | Alternate hot and cold whole length of spine, | 10 “ |
| K. | Alternate hot and cold whole length of spine, | 15 “ |
| L. | Alternate hot and cold whole length of spine, | 20 “ |
| M. | Alternate hot and cold to painful part, | 15 “ |
| N. | Alternate hot and cold, six changes, to painful part, | 30 “ |

### No. 4.—Ten-Minute Fomentations.

| | | | |
|---|---|---|---|
| A. | Over stomach and liver, | 140°, | two applications. |
| B. | Over spleen, | 140°, | “ “ |
| C. | Over bowels, | 140°, | “ “ |
| D. | Over bladder, | 140°, | “ “ |
| E. | Over right lung, | 140°, | “ “ |
| F. | Over left lung, | 140°, | “ “ |
| G. | Over both lungs, | 140°, | “ “ |

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* Massage of the head is not included in A, B, or C; so that where this is desired in addition it should be designated by adding D to the prescription.

| | |
|---|---|
| H. Over throat and bronchi, | 140°, two applications. |
| I. Behind stomach, | 140°, “ “ |
| J. Behind bowels, | 140°, “ “ |
| K. Behind lungs, | 140°, “ “ |
| L. Back of neck, | 140°, “ “ |
| M. On sacrum, | 140°, “ “ |

### No. 5.—Fifteen-Minute Fomentations.

| | |
|---|---|
| A. Over stomach and liver, | 140°, two applications. |
| B. Over spleen, | 140°, “ “ |
| C. Over bowels, | 140°, “ “ |
| D. Over bladder, | 140°, “ “ |
| E. Over right lung, | 140°, “ “ |
| F. Over left lung, | 140°, “ “ |
| G. Over both lungs, | 140°, “ “ |
| H. Over throat and bronchi, | 140°, “ “ |
| I. Behind stomach, | 140°, “ “ |
| J. Behind bowels, | 140°, “ “ |
| K. Behind lungs, | 140°, “ “ |
| L. Back of neck, | 140°, “ “ |
| M. On sacrum, | 140°, “ “ |

### No. 6.—Twenty-Minute Fomentations.

| | |
|---|---|
| A. Over stomach and liver, | 140°, two applications. |
| B. Over spleen, | 140°, “ “ |
| C. Over bowels, | 140°, “ “ |
| D. Over bladder, | 140°, “ “ |
| E. Over right lung, | 140°, “ “ |
| F. Over left lung, | 140°, “ “ |
| G. Over both lungs, | 140°, “ “ |
| H. Over throat and bronchi, | 140°, “ “ |
| I. Behind stomach, | 140°, “ “ |
| J. Behind bowels, | 140°, “ “ |
| K. Behind lungs, | 140°, “ “ |
| L. Back of neck, | 140°, “ “ |
| M. On sacrum, | 140°, “ “ |

### No. 7.—Thirty-Minute Fomentations.

| | |
|---|---|
| A. Over stomach and liver, | 140°, two applications. |
| B. Over spleen, | 140°, “ “ |
| C. Over bowels, | 140°, “ “ |
| D. Over bladder, | 140°, “ “ |
| E. Over right lung, | 140°, “ “ |
| F. Over left lung, | 140°, “ “ |
| G. Over both lungs, | 140°, “ “ |
| H. Over throat and bronchi, | 140°, “ “ |
| I. Behind stomach, | 140°, “ “ |
| J. Behind bowels, | 140°, “ “ |
| K. Behind lungs, | 140°, “ “ |
| L. Back of neck, | 140°, “ “ |
| M. On sacrum, | 140°, “ “ |

The prescription-blank would be as follows:—

**Prescription Card for Treatment of**

*Name* ________________________________

*Address* ________________________________

*Prescribed by* ________________________ *M. D.*

| | M. | T. | W. | T. | F. | S. |
|---|---|---|---|---|---|---|
| *No.* ________ | | | | | | |
| *No.* ________ | | | | | | |
| *Followed by No.* ________ | | | | | | |
| *No.* ________ | | | | | | |
| *At same time No.* ________ | | | | | | |

The masseur is requested to continue this treatment until otherwise directed, unless obvious change in the condition of the patient renders desirable an earlier consultation of the prescribing physician. The time of day may be indicated if desired.

The above is actually in use in this city, and its practical value demonstrated. The masseur or masseuse stands in the same relative position as the druggist to the physician, and simply carries out his directions as indicated by the prescription.

[NOTE.—In the foregoing pages an attempt has been made to indicate the characteristic features, physiological effects, and a few of the applications, of mechanotherapy. On account of the extent of the subject and the limitation of space, it is evident that only the most general conclusions could be communicated, and that many of the details of treatment are omitted. At the same time, it is exactly the details which should be scrupulously observed in order to obtain the most satisfactory results in an art like massage. It is, therefore, urged upon the attention of students and physicians that the physiological effects of mechanotherapy being what they are, and its results such as have been demonstrated, the subject should be intelligently and carefully studied by consulting such text-books as Douglas Graham's "Practical Treatise on Massage" (second edition), Murrell's "Practice of Massage," or Schreiber's "Treatment by Massage and Exercise," where the instructions are more explicitly given, and with a wealth of illustration and detail which is impossible in a general work on therapeutics. As Murrell remarks, massage is a therapeutic agent of the first rank, which will yield good results in a host of diseases other than those which have just been summarily reviewed. At the present day the intelligent practitioner cannot afford to be ignorant of the advantages and applications of massage, which is now employed by the leading specialists in nearly every field of medicine, with excellent results. Indeed, a proper understanding by the physician of what the

Chinese call "the body-regulating art" will lead him to apply it to his own case—obeying the injunction of "Physician, heal thyself!"—in order to maintain his own health and vigor amid the various disturbances to which he is subject in the pursuit of his arduous avocation; more especially if he live in a crowded city, amid the turmoil and excitement that keeps the nervous system in a constant state of tension, which is interpreted as the need for drugs, such as bromides, opium, and alcoholic stimulants; but which is better treated by massage and due regulation of bodily exercise and rest.]

## PNEUMOTHERAPY AND PNEUMATIC DIFFERENTIATION.

Pneumotherapy, **atmiatria,** or pneumatic medicine, considers the administration of gases and remedies in a gaseous condition in the treatment of disease. The effects of changes in density and of the use of remedies under circumstances increasing or decreasing atmospheric pressure have recently received so much attention that they will require separate discussion. The subject, therefore, will be divided into:—

1. The administration of remedies in a gaseous form: **Pneumotherapy.**

2. The administration of such remedies under altered conditions of atmospheric pressure, or in more or less condensed or rarefied form: **Pneumatic differentiation.**

A strict construction of the term "pneumotherapy" (*πνεῦμα*, air or breath, and *θεραπεύω*, to heal) would restrict it to the consideration of respiratory disorders, but it may also be employed as applied to treatment by the use of air or gases. An ancient medical sect, known as pneumatici, or pneumatic physicians, founded by Athenæus, held that an immaterial principle or element existed, upon which depended conditions of health the excess or diminution of which caused disease. Previous to the revelations of the microscope and the advent of modern pathology and chemistry, this was about as far as hypothesis could be expected to carry us toward the discovery of the true nature of many diseases, but there is no good reason for the existence of such a medical theory in the nineteenth century.

In proceeding to consider the therapeutic employment of certain gaseous substances, it is proper, in the first place, to devote a few words to a gaseous compound known as **atmospheric air,** its composition, and the effects upon the human system of alterations in the proportion of its constituents and the results of its contamination. Air is a universal and indispensable gaseous food. It is not a chemical compound, but simply a mixture of oxygen (about one-fifth) and of nitrogen (about four-fifths) with variable, but usually small, quantities of carbonic acid, ammonia, watery vapor, dust, etc. We cannot dwell here upon the physiological facts in connection with the effects of increase or decrease of carbonic acid or the presence of certain contaminations, especially the various forms of microbes and disease-germs. We may, however, in passing, point out, in a very general way, the difference in the rate of growth and development of children who have a plentiful supply of fresh, pure air as compared with those who lead a sedentary life in house or school. The subject of the ventilation of sick-rooms and apartments where many persons are crowded together, as in schools, factories, and work-shops, has been fully investigated of late years, and the breathing of foul air is now regarded as one of the principal causes of ill health.

Conversely, in many patients the first therapeutic step to take is to secure for them a greater quantity of pure air than they have been accustomed to having. In modern treatises upon the practice of medicine, great stress is usually laid upon the importance of the ventilation of living-rooms, and also of exercises in the open air. Drs. Trudeau and Sternberg found that the mortality from consumption, in rabbits inoculated with tubercle virus, was very much greater among animals confined in crowded, ill-ventilated hutches than among others which were allowed to run out and live in the open fields. Heated air has been employed in therapeutics not only in the form of the Turkish bath, but also used simply by inhalation. The effects here being simply those of elevation of temperature, they will be considered under the head of heat. The effects of differences of atmospheric pressure will be discussed in the present section, under the title of "Pneumatic Differentiation." The effects of breathing rarefied air are closely connected with those attending residence in elevated localities, where atmospheric pressure is less than at ordinary levels. This deserves careful study, as upon it often depends the decision as to the proper sanatorium to send an invalid. It may be accepted as an axiom that patients suffering with advanced disease of the heart, lungs, or kidneys are injured by removal to a high altitude, as their systems do not readily become accustomed to the increased labor of breathing necessarily required by the rarefaction of the air. This, however, will be considered, more in detail, under the subject of "Climatology." Under this head, also, will be considered the effects of the presence in the air of moisture, and the differences between marine and mountain airs and places.

The presence of ozone in the air, and its consequences, will be hereafter referred to in discussing oxygen. When present, it is an important witness to the purity of the air and its freedom from organic contamination. Where great numbers of people live in crowded communities, ozone is never present. If the fact is borne in mind that the expired air from the lungs contains more or less excrementitious organic matter, it will be understood why crowd-poison or re-breathed air may be the cause of disease. Besides the increased quantity of carbonic-acid gas and the diminished proportion of oxygen, the expired air further varies from the standard of pure air, in that it has an excess of moisture, which contains odorous particles, and frequently bacilli and other forms of bacteria. Atmospheric air, however, except in special locations on the tops of mountains, may also contain many varieties of bacterial forms, and also organic material, in the form of dust, which may be of a very irritating character. The expectorations of tuberculous patients in the streets become dried, and tubercle bacilli have been shown by actual experiment to be present in street-dust, as well as in the confined air of the consumptive wards in a hospital. Manifestly, therefore, persons who, by heredity or acquired predisposition, are liable to suffer from phthisis, should live in a neighborhood where they can breathe pure air, as free as possible from all irritating matters, and especially pathogenic substances, and they should carefully avoid crowded vehicles or public halls. Consumptive nurses should never be allowed to contaminate the air that young children breathe by fondling and kissing them, infants being particularly liable to infection from this source. Operatives who work in overcrowded rooms, such as cigar-makers, cloak- and dress-makers, especially where there is much dust in the air, show the effect of privation of fresh air in their pallid faces and wasted frames, and they are also very subject to pulmonary affections from inhaled particles, which act as irritants. The first prescription for a cough, under such circumstances, would be fresh air, as pure as can be obtained. One of the principal beneficial effects of the movement-cure and massage is seen in the increased activity of the respiratory function which follows physical exercises; but increased respiration will not be of great benefit unless, at the same time, provision be made to supply a sufficient quantity of pure air. The report of the English Army Sanitary Commission, published in 1858, is conclusive in its proof that "the excessive mortality from consumption among soldiers, and in particular regiments, was due to overcrowding and insufficient ventilation. Previous to that inquiry, the cubic space per soldier in the barracks of the Foot Guards only amounted to three hundred and thirty-one cubic feet, and the phthisis mortality was as high as 13.8 per 1000. In the Horse Guards, on the other hand, with a space per man of five hundred and seventy-two cubic feet, the mortality from phthisis did not exceed 7.3 per 1000. It was found that phthisis prevailed at all stations, and in the most varied and healthy climates, the vitiated air in the barracks being the only condition common to all of them. In consequence of this excessive mortality, the Commissioners recommended that the cubic space allowed per man in barracks should be increased and the ventilation improved, with the result that, from the time their recommendations were acted upon, the number of phthisical cases occurring at all these stations has materially diminished. Similar evidence is afforded by the statistics of the Royal Navy, and notably as regards the civil population, in the report of the Health of Towns Commission, published in 1844. Indeed, it has been fully established that not only phthisis, but other lung affections, such as pneumonia and bronchitis, are generated, to a large extent, under like conditions, and the same may be said of such diseases as scrofula, and others of an adynamic type."*

The announcement of the discovery of the tubercle bacillus by Koch, in 1882, has not invalidated the above observation. On the contrary, these observations are highly valuable, since they serve to explain the problem of susceptibility, or predisposition, by means of which some individuals acquire phthisis, while others, under similar circumstances of exposure, successfully resist the inroads of the bacilli. In fact, while the effects of constantly breathing vitiated air may not be at once manifested, or cause severe pain or discomfort, other than frequent headaches or feelings of malaise, the consequences, in undermining the health, appear slowly, and are cumulative, but not the less injurious. This is now universally recognized as among "the most potent and widespread of all the predisposing causes of disease" (Wilson). Following the dictates of sound judgment and experience, civilized nations have steadily improved the ventilation of dwellings and work-rooms, and systematically remove from cities garbage and filth which poison the air by undergoing fermentation and putrefaction, and giving off poisonous vapors and disease-germs. Especially in hospitals has attention been paid, of late years, to this essential point, in order to secure an aseptic atmosphere for the sick. By the use of forced ventilation, the supply of pure air is maintained, which is now generally acknowledged to be an important element in the treatment of both sick and wounded.†

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* "Handbook of Hygiene and Sanitary Science." George Wilson. London, 1877. Third edition, p. 65.

In the treatment of many chronic disorders, especially pulmonary affections, respiratory gymnastics, having for their object greater expansion of the chest and an increase in the tidal air, are of acknowledged value, and have been already referred to in the preceding section. In the treatment of asphyxia from coal-gas, carbon dioxide, or hydrogen sulphide, fresh air is absolutely necessary, as it is also in syncope and suffocation by drowning. As already intimated, many cases of cholera infantum are due to local poisoning of the air, and can be cured only by a change to a purer atmosphere. During the prevalence of yellow fever, cholera, small-pox, and other epidemic diseases, it sometimes becomes necessary to remove a whole community to a more sanitary locality, the best disinfectant being pure air, and plenty of it.

Since the famous experiments of Dr. Priestley, there have been many attempts made to render air more curative by adding to it various substances, either in gaseous form, or as a vapor, spray, or impalpable powder. The latter forms will be separately considered later, and in another part of the work will be given a number of useful formulæ for medicaments to be used by inhalation. Air may be made to carry not only gaseous substances, but liquids and solids in minute subdivision. An excess of watery vapor is present in the Russian bath. It is also useful for inhalation by means of a croup-kettle or steam-atomizer, after operations for tracheotomy, and also in cases of catarrhal inflammation of the throat and bronchial mucous membrane. Various volatile substances may be added to the water, such as oil of eucalyptus-leaves, compound tincture of benzoin, iodine, and carbolic acid. Smoke from burning nitre-paper, diffused in the air, gives marked relief in asthma, or pyridine may be volatilized for the same purpose. Tar, cresylic acid, phenol, and other substances may also be administered in this way in pulmonary affections, and often with marked effect. Among the gaseous substances proper, chlorine has been used, largely diluted, as a bronchial stimulant, in narcotic coma or hydrocyanic-acid poisoning. Nitrogen is inert, and the results of its inhalation are due to deprivation of oxygen from the system. Hydrogen produces a peculiar squeaking voice, but otherwise is negative. The effects of oxygen are so important that they will be considered in a separate section. Modern surgical anæsthesia depends upon the mixture of a certain amount of vapor, of chloroform, ether, or ethyl bromide, with the respired air. This will be considered in detail in the volume devoted to drugs, under the individual headings of the articles in question (such as chloroform, ether, etc.). Nitrogen monoxide, or laughing-gas, will be considered under its own title.

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† For further elucidation of this subject, see recent work by John S. Billings, U.S.A., on Hospital Construction.

Claude Bernard discovered that, under certain conditions, general anæsthesia could be produced for the time, by directing a stream of carbon-dioxide gas directly into the throat and larynx, but this observation has not yet been utilized in practical medicine. Bergeon some years ago brought out a system of treatment for chronic pulmonary disease, the principal feature of which consisted in the injection into the large bowel of a mixture of carbon-dioxide and hydrogen-sulphide gases, with a view to their absorption into the circulation and excretion by the lungs. Some good results in the way of lessened expectoration, reduction of cough, and temporary improvement of the physical condition have been noted after the clinical trial of this method, but, as it is impossible for it to exert any antiseptic action upon the tubercle bacilli, and the bodily improvement is only transitory, the practice has fallen into disuse. If it had succeeded in accomplishing all that was claimed for it by its enthusiastic advocates, it would have afforded some support to the theory of Beddoes that there is an excess of oxygen in the tissues of consumptives, and that they are benefited by breathing air containing a considerable proportion of carbon dioxide.

Attempts have been made to destroy septic matter in the air, or, technically, to "sterilize" the air, in order to prevent infection of wounds during operations. The antiseptic method of Sir Joseph Lister, as first formulated, required a spray of carbolic-acid solution, so that the operation should be performed in an atmosphere charged with this antiseptic. It was found that this was not only inefficient and failed to fulfill the purpose, but it also was objectionable, and in some cases caused symptoms of carbolic-acid poisoning. Mr. Lister has since acknowledged his mistake, and the spray has disappeared from the operating theatre. Experience has shown that, if everything else coming in contact with the wound—the surgeon's hands, the instruments, and all the dressings, and the wound-surface itself—is rendered aseptic by proper solutions, under ordinary circumstances the air may be disregarded, except when contaminated by special poisons like diphtheria or scarlatina. Dr. David Prince, of Illinois, however, has devised a very complete aseptic operating chamber, in which all the air is forced through antiseptic solutions before coming into the apartment. Where the air of a hospital is so contaminated as to require such a chamber, it would be safer to remove the patient, if possible, to more sanitary surroundings.

### OXYGEN.

Although not yet admitted to the United States Pharmacopœia, oxygen is a remedy of considerable therapeutic value, and, as an antidote to certain forms of poisoning, in some cases is indispensable to the recovery of the patient. It is administered in its purity or combined with other gases, such as nitrous oxide, nitrogen, or with atmospheric air. Oxygen is a colorless,* odorless, and tasteless gas, nearly sixteen times as heavy as hydrogen, a little heavier than atmospheric air (specific gravity, 1.1057), of which it constitutes 20.81 per cent. by volume, or 23 per cent. by weight, of dry air, in which it exists simply as a mixture with nitrogen and not combined. Under certain conditions, it appears under the allotropic forms of **ozone** and **antozone**, in which it acts with peculiar energy. Under ordinary circumstances, oxygen is a non-condensible gas, but Pictet has succeeded by cold and pressure, in making it assume the form of a liquid apparently containing solid particles. Water ($H_2O$) is a combination of oxygen with hydrogen (8 to 1). Hydrogen dioxide is also a liquid; clear, colorless, syrupy, and of a specific gravity of 1.453, it is a bleaching agent, and slightly caustic and somewhat irritating to mucous surfaces. It evolves oxygen at a temperature of 70 degrees or above, the ordinary commercial solution claiming to yield fifteen times its bulk of oxygen gas.

**Preparation of Oxygen.**—Among the several methods of preparing oxygen in the laboratory only those can be employed in medicine which are convenient and which yield a pure gas fit for inhalation. The most available method is by heating the solution of hydrogen dioxide, but where a considerable quantity is required this method would prove too expensive. The usual method is to heat potassium chlorate, so as to drive off some of its combined oxygen; and, in order to do this safely and to obtain the gas in steady volume, the potassium chlorate is intimately mixed with manganese dioxide, which does not enter into the reaction, but simply acts mechanically. The gas obtained in this way is passed through several wash-bottles containing dilute caustic alkali, and, it is then collected in a receiver (gasometer) and kept over water. Oxygen is now made on a large scale, commercially, directly from atmospheric air, and is sold at a very low rate, being delivered in steel cylinders, generally condensed so that a cylinder containing from one hundred to two hundred gallons is of a convenient size for handling. From such a holder or reservoir the gas is drawn into a rubber bag or a gasometer for ordinary office use or individual administration. If the extemporaneous plan of making oxygen is employed, care should always be taken to see that the binoxide of manganese is pure and clean. If it contain coal-dust or charcoal as an adulteration a serious explosion may result. It is, therefore, recommended to gradually heat some of the mixture (four of potash to one of manganese), in a glass test-tube, up to a red heat. If it should explode, the small quantity would do very little damage, especially when compared with that which would result from the explosion of several pounds of the same mixture. For each gallon of oxygen, about 214 grains (or nearly $\frac{1}{2}$ ounce) of potassium chlorate will be required.

**Physiological Effects.**—When inhaled, pure, oxygen is capable of causing considerable irritation in the air-passages, and small animals immersed in it perish in a few days with highly-congested lungs. Ordinarily, when a moderate amount is inhaled in health, no irritation occurs. The gas, even when pure, is pleasantly respirable, and from four to eight gallons can be inhaled without any other obvious effect than a slight increase of activity of the circulation and some nervous exhilaration. Slight giddiness may be experienced for a few moments, but vertigo and headache are absent. In addition to the quickening of the pulse, there is evidence in the lips and finger-nails of increased oxygenation of the blood, and cicatrizing wounds, with granulation tissue, have been observed by Demarquay to become more ruddy. The expiration of carbon dioxide is increased, and, according to some observers, is doubled in amount. Uric acid is lessened in quantity, according to Kollman, owing, probably, to the fact that a greater quantity is oxidized in the system. The digestion and appetite improve, and there are evidences of increased assimilation and resulting enhancement of physical strength.

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* In the liquid form, Olszewski, a Polish chemist, finds that oxygen has a bright, sky-blue color. This is of interest not only as accounting for the blueness of the atmosphere, but also in point of view of the absorption spectra of oxygen.

**Therapeutic Applications.**—As has probably been inferred from the preceding paragraph, the chief application of oxygen is to conditions of asphyxia and dyspnœa from any cause. Thus, in poisoning by coal-gas, sewer-gas, hydrogen sulphide, carbonic oxide or dioxide, oxygen inhalations, promptly used, are followed by immediate good effects. In dyspnœa attending pneumonia, morbid growths in the larynx, or other grave disturbances of respiration, oxygen is of great service. In various chronic cachectic conditions, the systematic administration of oxygen is often of value in improving assimilation and building up the system.

Thus, in anæmia and chlorosis, in chronic ulcers, and in strumous affections oxygen inhalations are practised in one, two, or three daily sittings, using from one to four gallons at a time, either pure or mixed with atmospheric air or other gas, such as nitrogen monoxide. When a stream of oxygen-gas is directed upon a granulating or gangrenous surface it is said that healing is accelerated. When there is some impediment to the respiratory function, as in stenosis of the larynx, croup, diphtheria, or emphysema, asthma, heart disease, œdema, or marked congestion of the lungs, the dyspnœa is greatly relieved by oxygen inhalations. The cyanosis of pneumonia is overcome by its means. In chronic pulmonary affections with reduced breathing capacity, we are now in a position to pass the same quantity of oxygen into the blood as is normally required, and thus put the patient on a more favorable footing for his ultimate recovery. As an illustration of its value, the following remarkable case of pneumonia successfully treated by its aid is worthy of study. It was reported in the Boston *Medical and Surgical Journal* (No. 21, 1890): "The patient was a lady aged 37, of neurotic tendencies, who suffered at first with ordinary lobar pneumonia at the base of the right lung. The general symptoms were very strongly marked, and, after the first few days of ordinary treatment, the disease spread to the upper part of the same lung, and alarming and excessive dyspnœa set in rather rapidly. Energetic stimulation and counter-irritation appeared to relieve the condition to some extent, but it recurred and showed itself less amenable to treatment. Inhalations of oxygen were given, the gas being simply conducted to the patient's mouth, after having been passed through a wash-bottle and diluted with 10 per cent. of nitrous oxide. Very decided relief was given for a short time, but again and again the dyspnœa returned, each time being staved off by the inhalation. At last it became necessary to keep up constant inhalation. The supply of gas began to fail, and before a fresh store could be obtained the patient was moribund. The gas was then given by artificial respiration, and the patient rallied once more. Constant inhalation was then kept up for one hundred and six hours without intermission, and at the end of that time the breathing was easy and natural, and complete recovery followed without further incident. The temperature fell during the long-continued inhalation, the average amount of gas being two hundred gallons in each twenty-four hours." Dr. Blodgett states that the effect of the gas was "almost as pronounced and evident as is that of a ligature in hæmorrhage." Dr. Lauder Brunton and Dr. Prickett report a case of pneumonia (*British Medical Journal*, January 23, 1891), where the patient was unconscious, livid, and almost moribund; but, after the inhalation of oxygen and the hypodermic injection of strychnine, he recovered his consciousness and his normal color, and expressed himself as feeling comfortable and well. Twenty-four hours afterward, however, breathing again became embarrassed, and, notwithstanding a somewhat freer use of oxygen, he died in a few hours. Dr. Skerritt, in the same journal (February 6), says: "I have never seen such an extraordinary effect upon cyanosis produced by any other means, and, for the future, in any case of acute respiratory affection threatening to prove fatal, I shall not consider that everything practicable has been done unless a fair trial has been given to oxygen."

Another writer suggests that, even where cases are manifestly *in articulo mortis*, they may be temporarily improved so as to sign or execute legal papers by its aid. On the other hand, cases have been reported where inhalation was begun and the patient promptly died (Colton: *Brooklyn Medical Journal*, August, 1891, p. 528). It is probable that the addition of 10 per cent. of nitrous oxide, by Dr. Blodgett, to the oxygen, contributed materially to the successful result. The question of details of administration will be again referred to shortly. In cardiac asthma, it has been shown that the condition of the heart-muscle and the aorta is often an active or predisposing cause. The change in the aorta may be small and those in the heart considerable, or just the reverse. The aorta is more or less the seat of atheroma. The change in the heart is a chronic myocarditis; the coronary arteries are also diseased.

In the diagnosis, according to Dr. Heitler,* if the organic lesion be overlooked, and a good prognosis given, it may be falsified by the patient dying suddenly from heart-failure. The most valuable sign is accentuation of the second aortic sound. For the dyspnœa and cyanosis of cardiac insufficiency, Dr. Heitler says the combined use of morphine and ether subcutaneously, with inhalations of oxygen, will cut the attacks short. In the opinion of Dr. Catlin,† oxygen is pre-eminently the remedy for profound shock, either from hæmorrhage or nervous drain, where the vitality is at too low an ebb to take up the intricate history of assimilation and repair. He reports a case of profuse hæmorrhage at the sixth month of pregnancy, followed by miscarriage. The prostration was absolute, with shock and constant vomiting. Continuous oxygen inhalations (mixed with air?), and the patient immediately improved and made a good recovery. He also reports cases of prostration during typhoid fever, in which oxygen was inhaled with marked benefit.

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* *Centralblatt für die Gesammte Therapie*, October, 1891.

† *Brooklyn Medical Journal*, August, 1891, p. 521.

Professor Tarnier has used oxygen inhalations in the treatment of very young children, and Bonnaire (*Journal de Médecine*, June 28, 1891) has employed it in the newborn, especially the premature infants who are placed in a "couveuse," or incubator. He gives the following suggestions:—

"1. Whenever there is insufficient pulmonary hæmatosis, either from obstruction of the respiratory passages or from weak action of the mechanical apparatus of respiration, or from want of excitation of the respiratory nerve-centre, oxygen administration is indicated. Apparent death in the newborn is, therefore, the first indication, though this does not exclude efforts at artificial respiration; besides, oxygen is not always available as soon as required. But if the first dangers of asphyxia have been overcome, and respiration is still ineffectual, or pulmonary disease imminent, with general asthenia, oxygen will be found a valuable recourse.

"2. Oxygen is also indicated for disorders in the interstitial circulation, of which sclerema in premature infants is one of the most common manifestations.

"3. Changes in the blood, of infectious origin like that which takes place in the hæmaturic bronze disease, of which mention was made." (It was used in several infants suffering with bronzing and hæmaturia, —a disease resembling pernicious anæmia. It was administered for two hours daily, and was successful in several cases in the first stage of the disease.)

"4. Conditions in which there is decided depression of the temperature. Athrepsia, in its acute and chronic forms, is the type of such conditions."

Neumann (*Therap. Monatshefte*, October, 1891) speaks in high terms of the administration of air containing a high percentage of oxygen, under increased pressure, for which he employs an apparatus of his own devising. By using a mixture with air, he avoids the irritation caused by the pure gas, and the slightly increased pressure facilitates absorption. The pulse, at first quickened, is ultimately slowed. No unpleasant head symptoms arise. There is no palpitation; in fact, the heart's action is regulated. Sleep is often induced, even in men. In many patients, the night's rest has been improved, the breathing rendered easier, and there has been induced a feeling of increased strength. In three cases of tuberculosis, treated at the same time with Koch's method, the fever disappeared in two and was lessened in the third. The action of iron, when given for chlorosis, may be increased by oxygen inhalation. Neumann has treated very severe cases of anæmia, convalescence from pleurisy, phthisis, sepsis, and diabetes with good results. He thinks that it also may be of service in gout, as it diminishes the proportion of uric acid in the urine.

Dr. Francesco Valenzuela has published a paper, in *El Siglo Medico*, on new methods of administering oxygen, with especial reference to the treatment of senile pneumonia. He administers the gas by the rectum, and also by injection hypodermically. He reports that in every case of senile pneumonia, with dyspnœa, in which oxygen enemata were given, dyspnœa was decidedly and permanently relieved. The ease and rapidity with which the gas was absorbed by the intestine were remarkable; indeed, it seemed to be as readily taken up by the intestine as by the lungs, four injections, of five litres each, being absorbed in an hour. Thus, the intestinal mucous membrane may be regarded as a valuable adjunct to the lungs in the function of respiration. In employing oxygen subcutaneously, Dr. Valenzuela believes it important to introduce the gas in a nascent state. The arm was selected for the injections, and the quantity of gas introduced varied from half a litre to a litre. Cellular emphysema was, of course, produced, and a sensation of heat was complained of, but both disappeared within a few hours. There was no calmative action or slowing of the respirations, but there was marked stimulation of the heart—a desirable result in the collapse that follows pneumonia and fevers of a typhoid character; and cerebral congestion and asphyxia. No mention is made of the temperature of the gas that was administered,—a point which, according to Dr. B. W. Richardson, of London, is of great importance.

It has been stated that oxygen inhalations are of service in the vomiting of cholera as well as in the algid stage.

Dr. G. Thompson,* from a review of the therapeutic value of oxygen, arrives at the following conclusions: (1) In dyspepsia, the gas controls the subjective symptoms; (2) it is effective in cyanosis, by diminishing the frequency of the respiration and relieving the subjective dyspnœa; (3) oxygen is of value in the partial inflammation of the lungs due to various causes; (4) it is especially useful in the dyspnœas of chronic Bright's disease, uræmia, pneumonia, capillary bronchitis, asthma, catarrhal bronchitis, congestion of the lung, and of the first period of œdema.

**Apparatus and Technique of Administration.**—Samuel S. Wallian attributes the failures observed from the use of oxygen to various causes, and to many conditions under which the gas may be devitalized (?) by the imperfect processes employed to evolve, store, and use it. He insists that the oxygen should be freshly prepared and washed before using. Except in special cases of narcotic poisoning, asphyxiation, syncope, and other serious emergencies, the gas should be well diluted. The undiluted gas may be given in quantities of eight hundred to one thousand cubic inches at a sitting, once or twice daily. It is more economical to dilute it with air, since a comparatively small portion only is utilized at each inspiration. If nitrogen monoxide be combined with it (oxygen, 2 parts; nitrogen monoxide, 1 part), as they are synergistic, better results are obtained. Dr. Wallian also insists that patients should be instructed or made to inhale the gas properly. The person being erect, and the chest thrown a little forward, the lungs are then filled to their utmost capacity, and the gas held as long as possible, then expired through the nasal chambers. The respiration should be deliberate, and not hurried. Better results can be obtained if patients are taught chest gymnastics, so as to develop the muscles of respiration and increase the capacity; imperfect habits of breathing, tight clothing, awkward position of the body, and sedentary occupations are to be avoided, as far as possible. Oxygen may also be administered internally, by charging water with it under pressure, and Wallian recommends the mixture of oxygen and nitrous oxide, as above, which are dissolved in the water under a pressure of one hundred to one hundred and fifty pounds to the square inch. Oxygen-water has already been used in the Paris hospitals by Dujardin-Beaumetz, with some good results, in dyspepsia, debility, and chronic pulmonary or digestive disorders. It has been highly extolled in the treatment of infectious diseases, like small-pox, scarlatina, diphtheria, etc., and in many forms of skin disease.

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* *Norsk Magazin for Lægevidenskaben*, Christiania, p. 274. Annual of the Universal Medical Scienes, 1891, vol. v, p. A-117.

For inhalation, the gas is supplied ordinarily in iron or steel cylinders, containing forty and one hundred gallons, under pressure. Attached to the cylinder is a cloth-covered rubber bag, which serves as a reservoir and enables the quantity taken to be accurately measured. A bottle partly filled with water is also attached, so that the gas from the reservoir passes through it, and is then received into the bronchial passages in the form of moist oxygen. A small gasometer may be attached, for the purpose of administering the gas under pressure, or for use when it is desired to introduce it into the rectum. The gas may also be injected into the bowel by an ordinary Davidson syringe connected with the rubber bag containing oxygen. In order that absorption may be facilitated, it should be of the same temperature as the interior of the body, or a little higher than the surface temperature.

## Ozone and Hydrogen Dioxide.

Attention has already been directed to an allotropic condition of oxygen which is known as ozone (from the Greek ὄζειν, to smell). It was so named by its discoverer, Schönbein, who announced that the sulphurous smell produced by a stroke of lightning was due to this substance, which is also known as "electrified oxygen." It is formed by the sparks from the static electrical machine, and also during the electrolysis of water and during the slow combustion of phosphorus in a moist atmosphere. Ozone was first obtained in appreciable quantity by von Siemens in 1854, who discovered that the noiseless electric discharge was much more productive of ozone than the intermittent discharge, and he constructed an apparatus for the production of ozone by means of tubes. Subsequently, this has been still farther advanced by the labors of the well-known firm of Siemens & Halske, of Berlin, who furnish a comparatively cheap apparatus, by which an unlimited supply of ozone can be obtained.

Ozone is a colorless gas, possessing a characteristic odor resembling dilute chlorine. If the air contain only the one fifty-thousandth part of ozone this smell is distinctly discernible. It is one of the most powerful oxidizing agents known, attacking and destroying many organic fabrics, such as rubber, paper, etc. Ozone has been liquefied at a temperature of

105 degrees, and under a pressure of 125 atmospheres. According to the investigations of Chappius, ozone in this state is of an intense blue color. The relationship of ozone to oxygen is peculiar. In the formation of ozone three volumes of oxygen become condensed to form two volumes of ozone. In the presence of iodide of potassium and moisture one-third of the ozone is spent in liberating the iodine and the other two volumes escape as oxygen. Test-papers are made by making a solution of starch and iodide of potassium, in which bibulous paper is immersed and then dried and cut into slips of convenient size. When it is desired to test for ozone one of the slips is moistened; if ozone is present in the air it will liberate iodine, which, in turn, will act upon the starch, producing a blue color. Ozone is found at the sea-shore; in the forest, especially if of coniferous trees; at the summit of mountains and high towers. It is usually absent in crowded cities and where organic matter is undergoing slow oxidation. Clouds owe their formation largely to ozone, which is more hygroscopic than oxygen; but only the upper surface of clouds and mists which are exposed to the sun's rays contain ozone; it is not found in dark and thick mists. A great amount of ozone is formed in the mist rising from the cold ground, under a clear sky, on a calm autumn or winter day. As Schönbein demonstrated, atmospheric ozone is only generated in considerable quantity when oxygen moisture and sunbeams combine, as in the familiar illustration of the bleaching of linen upon the lawn from the effects of ozone. According to Scoutetten, under the influence of light the green parts of plants exhale both ozone and neutral oxygen, both of which are again taken up in part by the growing cells of the plants.

**Physiological Effects.**—Some interesting results were obtained by Ringk after treating withered and drooping house-plants by ozonized water, a striking improvement being soon manifested. Owing to its powerful oxidizing effects, ozone is believed to play an important part in nutrition. The red blood-corpuscles have the power of converting oxygen into ozone, and it has been suggested that, since ozone has the power of rendering albuminous solutions uncoagulable by heat, it exercises a similar effect in the human body, and prevents coagulation in the blood-vessels during life. Protoplasm has the power of storing up ozone which it subsequently uses as a source of energy. In many organs, such as the liver, spleen, and thyroid glands, ozone is found in considerable quantity; in the muscles only slightly. Owing to the superior affinities of nascent oxygen, ozone plays an important part in tissue change.

In concentrated form ozone is irritating to the air-passages, and may cause inflammation, salivation, bloody expectoration and death. Œdema of the lungs was noticed by Binz, who claimed that a comatose condition supervened before any noticeable irritation of the bronchial tubes occurred and that guarded administration produced soporific effects. The effects of an increase or diminution of atmospheric ozone upon the health of communities has not yet been positively determined. Professor Falb, having noticed a remarkable diminution of ozone in the air in the summer of 1889, was led to attribute the epidemic of influenza to this fact. The air-bacteria are either destroyed or rendered less active in the presence of ozone, and, where this is absent, infection is more apt to spread. Ozone is nature's antiseptic agent, and Dr. B. W. Richardson, in his "City of Health," suggested that there should be a building like a gas-house, in which ozone should be made and dispensed by pipes to every house.

**Ozone in Medicine.**—It is evident that one of the principal advantages gained by sending patients away from a crowded city, especially where infection is present, is that the air is pure and contains appreciable amounts of ozone in the country. When it is possible, children, especially, should have frequent opportunities of getting fresh air; and, therefore, the charities which, like the Fresh-Air Fund and Country Week, take city children out of town during the extreme heat of summer are of great value, both in curing and preventing sickness. By special apparatus, it is possible to charge distilled and sterilized water with ozone, or ozonized oxygen may be passed through oil until it is saturated. These ozone preparations have high value as disinfectants and deodorizers. Ozonized water is capable of producing beneficial results in diseases of deficient oxidation, as in anæmia, chlorosis, lithæmia, and may be very useful as a germicide in treating infectious dyspepsia. Dr. Henry S. Norris, of New York, after the use of ozonized water internally in the treatment of fifteen cases of phthisis, reports that the results were beneficial in many of the cases. The oily solution is claimed to have especial value in chronic skin diseases, by inunction; in the dermatomycoses, or parasitic diseases, and in cases of infiltration of the skin and glands.

Schmidt (*Münchener Med. Wochenschrift*) has reported excellent results in two cases of epithelioma following parenchymatous injections of ozonized water, and considers that it may also be serviceable in sarcoma and in tuberculous tumors. In the treatment of diphtheria, Schmidt reports remarkable success from applications of ozone-water, and Ringk advises its internal administration. Dr. Schnee, of Carlsbad, claims that ozone-water is of the greatest benefit in true as well as in functional diabetes. In phthisis, ozonized oxygen (9 per cent.) gave good results, in the hands of Dr. A. Ransome.* The inhalations, which were taken three times a day (seven litres each sitting), were followed by notable improvement, chiefly by gain in weight. Iodoform in pills and codliver-oil were given, in conjunction with the oxygen, but much better results were obtained with the oxygen than previously. In cystitis, Dr. Duhrssen, of Berlin, obtained successful results following injections of ozone-water.

**Ozonized air** may be obtained by the apparatus of Labbé and Oudin, which consists of concentric tubes, three to four millimetres apart, the intervening space being traversed by static electrical current. To obtain a sufficient quantity of ozone, they take the interior tube, sealed and containing the rarefied air, which acts as a perfect conductor, and is perfectly applied to the surface of the dielectric, which is the glass. The other armature of this form of condenser is constituted by a metallic sheet applied to the internal face of the external tube, and it is between the metallic sheet and the surface of the internal tube that the current forms the ozone. The slightest elevation of temperature which is produced in the cylindrical space separating the two tubes is sufficient to produce a current of air, which ascends and bears along the ozone thus formed. Under the circumstances, the air does not contain more than eleven to twelve hundredths of a milligramme of ozone per litre, which the authors term the therapeutic dose. Experimentation having shown the perfect innocuousness of these inhalations, they were given to children suffering with cachexia and anæmia, and were not only well borne, but evidently curative, by increasing the oxyhæmoglobin until it reaches the normal figure. It was found, also, that tubercle bacilli were rendered less virulent, as a result of exposure of cultures to currents of ozonized air. Dr. Caillé, after an experience of five months and twenty-two cases, concludes that the daily inhalation of ozone increases the oxyhæmoglobin in the blood from 2 to 4 per cent. in a short time, that in pertussis these inhalations exert a distinctly curative influence upon the disease as regards duration and severity. Dr. W. J. Morton and Dr. Clarence C. Rice, of New York, have employed the local effect of ozone gas upon eight different patients, all of whom suffered from various grades of atrophic rhinitis and dry pharynx. The method employed was to instruct the patient to take a deep inspiration and then hold the breath while the ozone gas is allowed to pass into the nostrils through the tube. The current is passed as long as the patient can hold his breath. The immediate effect, though differing in degree according to the volume of gas employed and, probably, according to the sensitiveness of the nostrils, was a mild smarting of the nasal mucous membrane for several hours, together with increased secretion. The secretion, however, was more easily expelled and at the end of twenty-four hours the head felt unusually clear and the mucous membrane more comfortable than before the application. The odor from the nostrils disappeared after the second application. These results are encouraging, but whether permanent moistening of the mucous membrane and decrease of secretions can be obtained by the use of ozone can only be confirmed after a longer trial. Dr. Rice has also made use of a preparation called "therapol," a combination of sweet oil and 8.75 volumes per cent. of ozone, applying it locally on cotton by means of an applicator in two cases of ozæna with the effect of deodorizing the nostrils.[*]

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* *Medical Recorder*, London, May, 1890.

## NITROGEN AND NITROGEN MONOXIDE (NITROUS OXIDE).

In the mixture of gases constituting the atmospheric air, nitrogen simply acts the part of a neutral body, or as a diluent for the oxygen. The effects of breathing super-oxygenated air have already been considered. If we now turn to hypo-oxygenated air or air containing increased quantities of nitrogen, we are brought in face with the phenomenon known as "asphyxiation." When pure nitrogen is breathed the effects upon animals is quite uniform. Dr. George Johnson, in a paper on the "Physiology of Asphyxia and on the Anæsthetic Action of Pure Nitrogen,"[†] found that the animals rapidly succumbed as a result of the arrest of the pulmonary circulation. The right cavities of the heart were found enormously distended and the left were comparatively empty,

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[*] *New York Medical Journal*, August 19, 1893, p. 198 seq.

[*] *The British Medical Journal*, February 21, 1891.

—a condition which is evident during the life of the animal, the change from the normal taking place progressively during the progress of the asphyxiation. In the last stage of asphyxia there is a continuous increase of pressure in the pulmonary artery, while the systemic arterial pressure is falling. The immediate cause of the arrest of the pulmonary circulation appears to be the contraction of the pulmonary arterioles. The phenomena which result from the inhalation of nitrous oxide as an anæsthetic, in the opinion of Dr. Johnson, are strictly analogous with those observed in the early stages of asphyxia. At his suggestion, nitrogen was employed at the dental hospital for extracting teeth in nine patients: "In every case the result was the production of complete anæsthesia, with general phenomena precisely similar to those observed during nitrous-oxide inhalation. The pulse was first full and throbbing, then feeble; in the advanced stage respiration was deep and rapid, with lividity of the surface, dilated pupils, and more or less jactitation of the limbs, the only difference, in the opinion of some of those present, being that the anæsthesia was less rapidly produced and somewhat less durable than that from nitrous oxide, though in each case the tooth was extracted without pain." Subsequent experiments with a mixture of 3 per cent. of oxygen gave the following results: "Five patients took the 3-per-cent. gas. Anæsthesia was complete in 75 seconds (maximum) and in 60 seconds (minimum), the average time required being 67.5 seconds. In each case the tooth was extracted without pain, the duration of anæsthesia being somewhat longer than with pure nitrogen. In each case there was lividity, dilatation of pupils, and more or less jactitation." With a mixture containing 5 per cent. of oxygen the average time for producing anæsthesia was increased to 87.5 seconds. In each of four cases there was complete anæsthesia. One patient had three molar teeth extracted. "Although she said she felt the last two, the sensation appeared to be that of a pull and not of acute pain. In most of these four cases there was slight lividity before the removal of the face-piece. In only one case was there slight jactitation of the limbs; the other three patients were perfectly quiescent."

An interesting feature in Dr. Johnson's experiments upon animals was the effect of amyl nitrite in overcoming the contraction of the pulmonary arterioles, and thus permitting the right side of the heart to become empty, and the heart's action, previously almost suspended, was restored. By this means life was prolonged until death finally occurred from increasing venosity of the arterial blood. Inhalations of amyl nitrite may, then, be regarded as the remedy for asphyxia, and at least a partial antidote to nitrogen or nitrous oxide, especially when aided by artificial respiration.

The similarity of the anæsthesia produced by nitrogen monoxide to that occurring from asphyxia by any neutral gas, such as nitrogen, hydrogen, or carbon dioxide, was first pointed out by Professor Thomson, in a communication to the Philadelphia *Medical Times*, in 1875. This theory of the action of nitrogen monoxide in producing anæsthesia, denies any specific action, and ascribes the effects solely to the deprivation of oxygen. While this is possibly true of the complete anæsthesia, yet it must be evident that smaller quantities of nitrogen monoxide produce a sense of mental and physical exhilaration and increase the pulse and respiration, which is not due to diminution of oxygen, and does not occur with the other neutral gases above mentioned. It is this preliminary intoxication which has given it the popular name of "laughing-gas." It has already been suggested that the addition of nitrogen monoxide to pure oxygen is useful as a respiratory and cardiac stimulant, and its effects are preferable to those of oxygen alone; and this combination is also decidedly safer than pure oxygen, which is sometimes irritating.

In the *American Journal of the Medical Sciences* for August, 1891, appeared an article by Dr. Wm. W. Van Arsdale, giving a report of his experience with a mixture of nitrogen monoxide and pure oxygen as an anæsthetic. His object was to obtain anæsthesia without causing asphyxia. From Paul Bert's experiments, it is known that the latter can be obviated by the mixture of as much oxygen as is contained in atmospheric air (20 per cent.); but, under ordinary circumstances, the tension of the nitrogen monoxide is so reduced by this combination that no anæsthesia is produced, and animals breathe it with impunity, just like atmospheric air. The problem of obtaining the atmospheric superpressure was solved by Paul Bert in his hermetically-sealed, glass operating-chamber,—like a diving-bell. In this cage the patient, surgeon, and assistants were admitted, and, by means of the air-pump, any desired density of the air was obtained. Under these circumstances, it was found that the nitrogen monoxide and oxygen mixture produced anæsthesia without asphyxia. Dr. Van Arsdale sought to do away with the expensive chamber, and substituted a mask for the patient's face, which would admit of administration of the gas under pressure. He prefers a 10-per-cent. mixture of oxygen, administered by an ordinary bag, rubber tube, and an air-tight mask. The great difficulty in most cases was found to lie in the fact that patients would not breathe deeply, but this was overcome by applying pressure,—by placing a board weighted to five pounds upon the reservoir-bag. His conclusions were, that many cases were unsuitable to this method, the failures being due to nervousness, idiosyncrasies, and possibly alcoholism. But ruling out these cases, he says: "In the majority of cases, however, in young, healthy individuals and in females, the anæsthetic mixture, when administered under pressure, was found to work well, and to be much superior to the pure nitrogen monoxide for surgical purposes. It induces a state resembling a quiet, deep sleep, in which the respiration is slow and regular, the pulse regular and full, and not much, if ever, increased in frequency. The blood-pressure is not increased, and insensibility to pain and unconsciousness go hand-in-hand.

"We have," he says, in conclusion, "in the 10-per-cent. mixture of oxygen and nitrogen monoxide, an anæsthetic which may be administered with perfect safety, and for a sufficiently long time to permit of the circumspect performance of most minor operations, but one which may be characterized as a weak anæsthetic. For, although it will plunge the average adult into a state resembling peaceful slumber, in which anæsthesia and unconsciousness are well marked, it cannot gain victory over states of great nervous excitement or dread, or certain habits or idiosyncrasies." In other words, this form of anæsthesia resembles ether, which sometimes fails to produce anæsthetic sleep, and recourse then is usually had to the more powerful chloroform.

Nitrogen monoxide has been used therapeutically in certain nervous affections. Dr. W. R. Birdsall* published the results of his experiments upon sixteen patients suffering with various neurotic complaints. In none of these did he observe any positively beneficial effect. He used 20-per-cent. diluted gas during a *séance* lasting ten to thirty minutes. The effects were transient, and he concludes that the uses of nitrogen monoxide for medical and surgical purposes must be restricted to its effects as an anæsthetic and as a placebo.

Nitrogen monoxide is usually obtained by heating ammonium nitrate, which decomposes at an elevated temperature and forms water and nitrogen monoxide ($NH_4, NO_3 = 2 H_2O + N_2O$). The product is washed by passing through water, which soon becomes saturated with the gas. It is kept in a gasometer, or in retorts obtained from manufacturers of the gas, in which it is reduced to a liquid form by strong pressure. From these small cylinders the administrative bag is filled, as occasion requires, for use in brief surgical operations, such as pulling teeth, etc.

Oxygenated, aërated water is a proprietary article containing five atmospheres of nitrogen monoxide in water. It has but little odor, and is slightly sweetish to the taste. It has no special therapeutic effects.

The other gaseous elements are used in medicine only very exceptionally. **Hydrogen** gas will produce asphyxia, like nitrogen monoxide, but its inflammability and liability to be contaminated with metals like arsenic and zinc make it dangerous. It has been lately brought to notice by Dr. Senn, of Milwaukee, who injected it into the bowels, in order to detect any perforation, by the flame-test, but this has been found unsatisfactory, and has been abandoned.

### PNEUMATIC DIFFERENTIATION.

In the preceding article reference was made to an apparatus for the administration of remedies under pressure. Pneumatic differentiation is the process by which the air surrounding the body and that entering the lungs are rendered of different pressures. It may be positive, negative, or alternate. The first is where the air entering the lungs is maintained, during both respiratory acts, at a greater pressure than that surrounding the body. Negative differentiation is the reverse of this. Alternate differentiation is where the other two forms are alternated successively, the air entering the lungs under greater pressure, and in expiration the pressure surrounding the body being greater.

An apparatus was invented by Dr. Williams, for the purpose of applying this method of treatment, and is known as the "Pneumatic Cabinet." The physics and physiological effects of pneumatic differentiation have been sufficiently discussed in a number of communications, which appeared some ten years ago, when the Williams Pneumatic Cabinet was first brought to the notice of the profession. In an article by Dr. Isaac H. Platt,† of Brooklyn, on the "Physics and Physiological Action of Pneumatic Differentiation," a very good *résumé* of the subject is presented. It is very evident that this apparatus, which increases the air-pressure within the lungs, and also enables us to diminish the tension of the external atmosphere and thus empty the air-cells more completely, will not only produce fuller respiration, but also will act as pulmonary gymnastics, through the greater activity of the bronchioles and air-cells. There is, in consequence, freer expansion and the opening up of collapsed lobules, while the expectoration of exudative material and foreign substances will be assisted. The secondary effects upon the pulmonary circulation will also be of considerable importance in bringing a larger quantity of blood under the influence of the air, but the effect of this is not so great as would at first be expected, owing to the tendency to increase of residual air, and the production of qualitative or partial emphysema. Dr. Platt concludes, from a summary of the effects of pneumatic differentiation, that, "by means of the differential process in its three forms, we can increase or diminish the difficulty of expiration or of inspiration; we can increase or diminish the tidal air, the vital capacity, the stationary air, and the residual air. We can, to some extent, control the amount of blood in the lungs, and consequently control pulmonary congestion and hæmorrhage, and we can raise or lower arterial blood-pressure. It is hardly possible that such widespread phenomena can be induced without producing other and secondary results, through the influence of the nervous system and otherwise." Therapeutically, Dr. Platt concludes: "The result of my experience and study has been to convince me that a large share of the benefit derived from the use of the cabinet is due to reduction of congestion, and consequently of inflammation, in the diseased lung by the differential pressure, in very much the same way as a bandage will afford relief to an inflamed joint. In addition to this, undoubtedly, the increased expansion to which the lungs are subjected, and the passive exercise which they are afforded, will do much to modify their nutrition and increase their vitality."

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* *New York Medical Journal*, March 7, 1891.

† *New York Medical Journal*, November 6 and 13, 1886.

The pneumatic cabinet has also been advocated as a means of conveying medicated vapors and gaseous medicaments deeper into the pulmonary structures than is possible by ordinary means. Although the enthusiastic advocates of this treatment speak in high terms of the results, it really has not been shown beyond question that such remedies are really introduced more deeply into the air-cells and bronchioles than under ordinary pressure, except in so far as air-cells which had collapsed or have been plugged up have expanded under the pulmonary gymnastics. The subject is worthy of more attention and study, but it is beyond the reach of the ordinary practitioner. In institutions for treating pulmonary affections and hospitals room may well be found for such a highly specialized apparatus, and a limited field of usefulness determined for it.*

More attention has been given to the subject of the administration of air and other gaseous elements, under varying pressure, of late years, especially in Europe. In France, at Contrexéville, there is an aëro-therapeutic institute. The pneumo-therapeutic institute of Brussels is especially worthy of mention. It gives:—

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* Those interested in this subject may refer to the Proceedings of the American Climatological Association for 1886 for papers by Professor Loomis, of New York; Dr. Donaldson, of Baltimore; Dr. Williams, of New York, and Dr. Platt's paper, already referred to. *The Philadelphia Medical Times*, vol. xvi, p. 654, contains abstracts of these papers.

1. Baths of compressed or rarefied air, with or without supersaturation with oxygen gas.
2. Inhalations of compressed air with expiration into rarefied air.
3. Electrotherapy.
4. Acts as a depot for manufacture and sale of oxygen gas.

The effect of baths of compressed or rarefied air, will be discussed farther on, when considering the physiological effect of climate. Reference can only be made here to the apparatus of Waldenburg, Solis-Cohen, and others, for the administration, by a sort of gasometer, of compressed or rarefied air, the effects of which resemble those already mentioned as resulting from the pneumatic cabinet. For further elucidation of the subject the reader is referred to Dr. Arthur Hill Hassall's work on "The Inhalation Treatment" (London, 1880) and other recent literature in this field of therapeutics.

**Medicated Vapors—Atomization—Inhalation.**—Volatile medicinal substances may be vaporized and the odor, smoke, or vapor inhaled; non-volatile substances may be dissolved in any convenient menstruum, such as water, liquid petrolatum or oil, glycerin, etc., and made to assume a condition of fine spray by means of an atomizer, of which there are several kinds. In the first form to be described the apparatus consists of a convenient-sized rubber bulb connected with a hermetically-sealed bottle or receiver containing the medicated solution, into which air is forced by compression of the bulb, thus displacing the liquid, which escapes through a tube with a capillary point, at the side of which a strong blast-air is forced, thus comminuting the drops into a fine spray. In another form the air is not forced into the bottle, but is directed across the extremity of the delivery-tube in such a manner as to produce a partial vacuum, which causes the liquid to rise into the tube and to escape in a fine cloud. In an improved form, the blast of air is supplied from a metallic receiver, into which it had previously been forced by an air-pump. A well-known form is the steam-atomizer, in which the steam from boiling water supplies the blast. In the several forms of steam-atomizers there is the advantage of the warm moisture, but the remedies should be in stronger solutions than for the hand-atomizer, or dry atomizer, because of the dilution by the steam. Solid substances may be finely powdered for insufflation and inhalation, although this scarcely comes within the limits of the present subject. Below may be found some formulæ for use with inhalers and atomizers.

**Formulæ for Inhalation.**—These remedies may be ordered to be simply dropped upon a handkerchief and held to the nose, or poured upon absorbent cotton, in a test-tube or special-shaped tube for inhalation, or contained in a **respirateur** of wire gauze covering the nose and mouth. In infants or invalids the remedy may be dropped upon the patient's clothing or simply upon the pillow:—

℞ Spts. ammoniæ aromat., . . . . . . . . q. s.

For inhalation in syncope, heart-failure, narcotic poisoning, etc., being careful that the vapor or gas is well diluted with air.

The following combination is much used in England:—

1—℞ Acid. carbolic., pur., . . . . . . . . ℥j.
Carbon. ligni, . . . . . . . . . ℥ss.
Iodi, . . . . . . . . . . . . ʒj.
Mix the pure carbolic acid with half of the wood charcoal thoroughly; mix the iodine with the other half, and mix together.

2—℞ Ammonii carbonat., . . . . . . . . ℥j.
Carb. ligni, . . . . . . . . . . . ℥ss.
Camphoræ, . . . . . . . . . . . ʒj.
M. Add Numbers 1 and 2 lightly together, add 20 drops of oil of lavender, and as much compound tincture of benzoin as is needful to make a thick paste, and put in a wide-stoppered bottle.—MR. DURHAM, of London.*

The following is Brand's (of Vienna) remedy for acute coryza, and is much used as an inhalation for nasal catarrh and coryza:—

℞ Acid. carbolic.,
Aq. ammoniæ fort., . . . . . . . . āā fʒv.
Alcoholis, . . . . . . . . . . . f℥ij.
M. Sig.: Keep in a dark place or in a tinted glass bottle.

A few drops are to be poured on blotting-paper, and this rolled into a cone, and the vapor inhaled as long as it rises. The eyes should be kept closed, on account of the irritating nature of the vapor.

℞ Camphoræ, . . . . . . . . . . . ʒj.
Sig.: Add to a pint of boiling water, and inhale the vapor, for acute coryza.

Beverly Robinson also recommends the following:—

℞ Acid. carbolici,
Creosoti, . . . . . . . . . . . . āā fʒj.
Tinct. iodi, . . . . . . . . . . . fʒiv.
Alcohol., . . . . . . . . . . . . f℥j.
M. et Sig.: For inhalation.

℞ Ol. pini sylvestris, . . . . . . . . . fʒj.
Succus conii, . . . . . . . . . . . fʒij.
Tinct. benzoin. co., . . . . . . . . . fʒij.
Magnesii carb., . . . . . . . . . . ʒss.
Aquæ, . . . . . . . . . . . . . f℥j.
M. Sig.: For inhalation with a nasal inhaler.

By employing a receptacle holding hot water (a pint or less), the volatilization is hastened by the heat, and the effect is more powerful. In the dry form of catarrh, steam fumigation or atomization is better than the dry inhalation. The following require hot water:—

℞ Tinct. benzoini co., . . . . . . . . . f℥j.
Sig.: A teaspoonful for each inhalation.

℞ Ol. pini sylvestris, . . . . . . . . . fʒij.
Magnesii carb., . . . . . . . . . . ʒiss.
Aquæ, . . . . . . . . . . . q. s. ad f℥iij.—M.

Or the following:—

℞ Creosoti, . . . . . . . . . . . . fʒiv.
Mag. carb., . . . . . . . . . . . ʒj.
Aquæ, . . . . . . . . . . . q. s. ad f℥iij.
M. Sig.: A teaspoonful for inhalation.—ROBINSON.

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* From "Nasal Catarrh and Allied Diseases," by Beverly Robinson. Second edtion. New York, 1885.

℞ Tinct. iodi co., . . . . . . . . . . . f℥j.
M. Sig.: Ten to twenty drops for inhalation.

℞. Amyl. nitritis, . . . . . . . . . . . fʒj.
M. Sig.: Three to five drops may be inhaled from a handkerchief; or small, glass pearls, each containing the required dose, may be used in the same manner.

℞ Chloroformi, . . . . . . . . . . . . fʒj.
Tinct. lavandulæ co., . . . . . . . . . . fʒiij.
M. Sig.: A few drops may be inhaled for irritative cough, as in phthisis.

The following, which is known as Dobell's formula, is very largely employed as a detergent (Dr. Robinson uses thymol in place of carbolic acid):—

℞ Acid. carbolic., . . . . . . . . . . . ♏xl.
Sodii biborat.,
Sodii bicarb., . . . . . . . . . . āā ʒij.
Glycerini, . . . . . . . . . . . . fʒvij.
Aquæ, . . . . . . . . . . . . . . f℥iij.
M. Sig.: Solution for nasal spray to be used as directed.

℞ Acid. salicylic., . . . . . . . . . . ʒj.
Sodii biborat.;
Sodii phosphat., . . . . . . . . . . āā ʒij.
Chloral. hydrat., . . . . . . . . . . . gr. xx.
Glycerini,
Aquæ rosæ, . . . . . . . . . . āā f℥j.
Aquæ, . . . . . . . . . . . q. s. ad f℥viij.
M. Sig.: Use frequently in initial stage of acute coryza.

The late Morell Mackenzie* recommended the following:—

*Antiseptic Nasal Sprays or Nebulæ.*

Sol. acid. carbolici, . . . . . . . . . gr. iij ad f℥j.
Sol. acid. sulphurosi. (Should be cautiously inhaled).
Iodum cum acidi tannici:—
℞ Tr. iodi, . . . . . . . . . . . ♏iij.
Glyceriti acid. tannici, . . . . . . . ♏xij.
Aquæ dest., . . . . . . . . q. s. ad. f℥j.—M.
Sol. iodoformi:—
℞ Iodoform., . . . . . . . . . . gr. xl.
Ether. (sp. gr. 735), . . . . . . . . f℥j.—M.
Potassii permanganat., . . . . . . . . gr. v–f℥j water.
Sodii benzoat., . . . . . . . . . . gr. xx–f℥j water
Zinci iodati:—
Iodated zinc caustic, . . . . . . . ♏xij or more.
Aquæ destill., . . . . . . . . q. s. ad f℥j.—M.

*Astringent Sprays.*

Acidi tannici, . . . . . . . . . . gr. v ad f℥j.
Alumen. chlorid.:—
℞ Liq. alumin. chlorid., . . . . . . . ♏iij.
Aq. dest., . . . . . . . . q. s. ad f℥j.—M
Alumen., . . . . . . . . . . . gr. viii–f℥j.
Ferro-alumen., . . . . . . . . . . gr. iii–f℥j.
Ferri perchlorid., . . . . . . . . . . gr. iii–f℥j.
Ferri sulphas, . . . . . . . . . . gr. ii–f℥j.
Zinc. chlorid., . . . . . . . . . . gr. ii–f℥j.
Zinc. sulphat.. . . . . . . . . . . gr. v–f℥j.

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* "Diseases of the Throat and Nose." Morell Mackenzie, London, 1884.

*Detergent Sprays.*

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|---|---|
| Dobell's solution. | |
| Potassii chlorat., | gr. xx–f℥j. |
| Sodii chlorid., | gr. v–f℥j. |

*Sedative Sprays.*

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|---|---|
| Potass. bromid., | gr. xx–f℥j. |
| ℞ Tr. belladonnæ, | ♏x. |
| Aquæ calcis, | f℥j.—M. |

*Antiseptic Sprays.*

| | |
|---|---|
| Acid. lactic. :— | |
| ℞ Acid. lactic., | ♏xxx. |
| Aquæ, | f℥j.—M. |
| Liq. calcis, | q. s. |
| Sodii salicylat., | gr. xx–f℥j. |

There is often an advantage in having the liquid warm before spraying; this is not required when the steam-atomizer is used.

## HYDROTHERAPY AND BALNEOTHERAPY.

The medicinal application of water by any method comes, strictly speaking, under the domain of hydro-therapeutics, which is, therefore, a very comprehensive term. Hydrotherapy (ὕδωρ, water, and θεραπεύω, I treat) comprises both the internal and the external use of water in the treatment of disease. The numerous forms of external administration —by wet packs, showers, douches, sitz or partial, plunge, and hot and cold baths—have given greater importance to the latter of these methods, so that the popular idea of "water-cure" is that it is mainly a course of bathing. Balneo-therapeutics (βαλανεῖον, a bath, and θεραπεύω, I treat) is that department of therapeutics which deals with the application of baths in the treatment of disease, the different varieties of which will presently be considered in detail. The term "balneo-therapeutics" is also applied more specifically to the science that treats of the effects of mineral waters and baths, especially as conducted at certain health resorts, known as "baths" or "springs." Leichtenstern, in von Ziemssen's "Hand-book of Therapeutics," defines balneotherapy as "the science of the therapeutic application of mineral waters," or "the science of the method and mode of operation of bath- and well- cures." In connection, therefore, with this topic, the composition and character, also the physiological and therapeutical effects, of various more or less celebrated mineral springs, require to be considered somewhat in detail. At the outset of our discussion of the therapeutic applications of water and water-dressings, we encounter the difficulty, as pointed out in the most recent and highly valuable little treatise of Dr. Simon Baruch,* of the existence of a belief on the part of many enthusiastic advocates of hydropathy, that it is a panacea, and that it is a complete system of therapeutics rivaling regular medicine, and destined, finally, to overcome it. This is unfortunate, since it has led to the establishment of

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* "Uses of Water in Modern Medicine." Physicians' Leisure Library, Detroit, 1892.

"water-cure" establishments for the treatment of all diseases, and too frequently these are carried on in an empirical manner, under the control of ignorant laymen or irregular practitioners. Moreover, the influence of Priessnitz, who, by occupation, was a farmer, but who was an ardent advocate of hydropathic treatment for all diseases, is still felt by his successors; so that there is still, in some quarters, decided antagonism between the practitioners of scientific medicine and the sect of so-called hydropathic physicians. This reproach of hydro-therapeutics is now about to be done away with. Of late years, the subject has attracted the attention of able investigators and teachers, among whom stands, notably, Professor Winternitz, who by Dr. Baruch is styled the father of modern hydrotherapy, and who is the author of the able treatise upon this subject in the fifth volume of von Ziemssen's "Handbook of Therapeutics."

**Historical.**—It is simple justice to the ancient physicians to state that the therapeutic, as well as the hygienic, value of water and bathing was highly appreciated by them. In the "Vedas" of Susrotas, water is often spoken of as an article of dietetic treatment, and even as an antidote, the number and the times of the baths being exactly regulated, and, indeed, with great minuteness of detail. In ancient Greece, in the midst of groves rich in springs, and in the vicinity of thermal springs particularly, stood temples dedicated to Asclepias. Prayer, fasting, and bathing were conducted, under the strict rules of the priests, and, after the patients had pursued the required course, a votive offering was made containing brief notes of the symptoms and treatment. In the halls of these temples Hippocrates found a rich mine of therapeutic literature, which he utilized with the hand and brain of a master. It is not surprising, therefore, that his system of pathology was principally humoral, and that water played an important part in his therapeutics. "He was the first to maintain that cold water warms, whilst warm water cools, the body. He was acquainted with shower-baths and shampooing; he noticed that warm showers induce sleep, and cold water, poured over the body, is useful in fainting. He treated tetanus with showers, and in affections of the joints he recommended the pouring over of cold water as being useful in relieving the pain and curing the affection. 'Articulorum tumores et dolores absque ulcere et podagricas affectiones . . . . frigida large effusa (aqua) levat et minuit, doloremque soloit.' Withal, his views on the hygienic value of water were remarkably advanced. He says, in the 'Tractatus de Aëre, Aqua et Locis,' that 'the first duty of the physician, when he comes to a town, is to become acquainted with the peculiarities of the waters used there—whether they are boggy, or hard, or soft, and whether they come from hills or rocks,' etc. Since elevation of temperature was known to him as a symptom of fever, he recommends the use of cold water against the different varieties of it; even the reactionary influence of cold applications was not unknown to him." He also understood the principle of revulsion, as well as the heat-abstracting action of cold-water applications. "We perceive, also," continues Winternitz, "in the introduction of therapeutical principles true to nature, the first important beginnings of hydro-therapeusis in scientific medicine. From this time, water commands a place in therapeutics, and, since its soothing and anti-inflammatory properties are the most striking, we see how it is taken up by the different medical schools," all making greater or less use of it, even with fundamental doctrines as much at variance as the humoralists or physiaters and methodists, or the dogmatists and empirics. In the writings of Galen, due recognition is made of the value of water in therapeutics. With the exception of the celebrated code of health of the school of Salernum, however, the writings of the Middle Ages contain little reference to this method. In the seventeenth century it began to receive greater recognition, especially in England (Floyer; T. Smith), and, in the beginning of the eighteenth century, in Germany. F. Hoffmann and Hahn, toward the middle of the last century, advocated cold sponging in fevers.

Hydrotherapy received greater impetus toward the latter part of the century, in England, by the writings of James Currie, William Wright, and W. Jackson. The method was subsequently advocated by Reuss, Frohlich, Brandis, Horn, and others. About 1743, John Sigmund Hahn, in Germany, systematized the practice of hydropathy, but it was falling again into disuse, when, soon after 1820, Vincent Priessnitz, a small farmer of Graefenberg, in Silesia, began to treat every kind of ailment, chronic as well as acute, with various hydro-therapeutic procedures, and added to the external applications the abundant internal use of water, combined with active exercise and a very simple diet, prohibiting, at the same time, all alcoholic beverages, and also tea and coffee.* The error of Priessnitz has already been referred to, and is one that medical-system makers generally fall into. It was that there is a universal method of treatment applicable to all cases. He, however, succeeded in making the medical value of water to be better appreciated by both the profession and the laity, and the furore which his treatment excited was of great value to regular medicine, in directing attention again to this highly important therapeutic resource.

Among contemporaneous writers, we may mention Ernest Brand, who published his work in 1861, showing remarkably favorable results, especially in typhoid fever, following immersion and compresses at from 54° to 68° F. Beutels, Juergensen, Winternitz, Charcot, Valleix, Dujardin-Beaumetz, and numerous other authorities and teachers have, by their labors, brought the science of hydropathy into system, and greatly advanced its practice.

Kneippism is a recent development of hydropathy, under the direction of an enthusiast almost as ignorant of medicine as Priessnitz, and, in his methods and results, curiously recalling to our mind the history of the great empiric. The Abbé Kneipp is 70 years old, a parish priest of the Roman Church. Having read Hahn's book, and cured himself by the liberal use of cold water, according to its directions, he has ever since been a zealous advocate of cold water as a remedy for all diseases. A recent writer, Dr. L. Reuss,† thus describes his method:—

He undertakes to cure a long list of maladies, from asthma to shingles. For each of these maladies, Vater Kneipp's principal, if not his only, medicine is cold water, applied in the shape of douches, foot-baths, head-baths, sitting-baths, and so on. Given in the form of drink, the water is often mixed with infusions, decoctions, or alcoholic tinctures. Always, however, water is the base of the medication. The simples recommended by the Abbé are very numerous, and the country people know them well. The leaves and flowers and roots and berries which he uses can be found, with few exceptions, at all our herbalists.

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* Herrmann Weber: Quain's Medical Dictionary, p. 667.

† "Annales d'Hygiène Publique et de Médicine Legale;" *Times and Register*, May 7, 1892, from "Literary Digest."

The worthy Abbé's system, however, is not one of therapeutics alone; it is also one of hygiene. He maintains that the many diseases of our day—affections of the heart or the breast, gastritis, anæmia, nervous disorders—were almost unknown to our ancestors, and are the result of our bad mode of living. He declares that the most of our maladies are due to trouble in the circulation of the blood. To remedy this, the body should be subjected to the action of the exterior air, combined or not with the action of icy-cold water. Children should be allowed to go without shoes or stockings. Adults should often walk in the fields, even in winter, barefooted. In winter a walk with bare feet in the snow is absolutely recommended, only the snow should be fine, like dust, freshly fallen, and there should not be a cold and piercing wind blowing. The length of this snow walk should not exceed three or four minutes. A walk in running water has an incontestable tonic effect.

To keep well, according to Kneipp, you must dress and eat according to a certain system. You must discard woolen clothing next to the skin. Kneipp declares that if wool develop more heat than other cloth, it does so to the detriment of the human body. You must wear next to the skin a shirt of coarse cloth, as coarse as that of which grain-sacks are made. Fur collars, fur gloves, knit vests and shawls, and all that sort of thing, must be absolutely discarded.

Finally, if people want to get well and stay well, they must change their diet and drink. They must eat food which is richest in nitrogen,—milk, cheese, peas, beans, lentils, meat, and fish. They must avoid food poor in nitrogen, like the cereals, potatoes, vegetables generally, and fruits, and have nothing to do with fats and oils. They must drink a minumum of wine, of cider, of beer, and have nothing to do with brandy. Coffee, with or without milk, chocolate, and tea are anathematized, especially coffee with milk, which debilitates the stomach, leaving it without digesting. Coffee with milk and beer, Kneipp counsels to replace with coffee prepared from acorns or with malt. This drink (Kneipp coffee) has nutritive and sedative qualities, in which ordinary coffee is absolutely lacking, and has also an excellent taste.

"Such is Kneippism. Whether it will make the tour of the world or even the tour of all Germany, the future alone can disclose. At all events, the system, if it cannot be recommended in its entirety, is not without commendable features."

At the present day, the achievements of hydrotherapy and the advancement of physiological and pathological knowledge demand from every intelligent physician an attentive investigation of its principles and practice. If this should be generally done, it will, beyond doubt, lead to a more general employment of such a valuable therapeutic aid.

Professor Peter, of Paris, indeed, goes so far as to declare, in his preface to Duval's "Hydrotherapie," that "hydrotherapy suffices, in most cases of disease; added to other treatment, it is a most powerful auxiliary. Can any one speak better or say more of it?" *

**Physiological Effects.**—The erroneous idea has gained ground that the only object of bathing, in acute diseases, is reduction of temperature. It is true that pyrexia can be modified or reduced by this means, but other physiological and therapeutic results are produced, as will be seen from the following brief review of the physiological effects of water:—

Thirst is the sensation analogous to hunger experienced as a result of privation from water or fluids, after profuse watery discharges or hæmorrhages, and also as a result of the drying up of secretions, in some cases of fever. Life cannot be sustained without constant renewal of the water of the organism, to replace that lost by excretion, exhalation, and evaporation. Tissue-change and its functions are dependent upon the presence of water in sufficient quantity. This is partly supplied by the water contained in our food, and partly by the water which is drunk. Temporary excess of supply leads to increased discharge by the excretions and enhanced metabolism; whereas, relative deficiency produces a diminution in the quantity of the excretions. Where the increased ingestion of water continues for several days, it is observed that volume of the blood is increased, and there is an increased removal of the products of retrogressive tissue-change; the blood, the tissues, and the kidneys being, so to speak, washed out by it. The urine is more abundant and the solids are slightly increased. In consequence of the removal of the used-up material, the organism is able to take up a larger quantity of new nutritive substance. As a result, if not carried to excess, so as to disturb digestion, plentiful water-drinking causes increase of bodily weight; the urine, the saliva, bile, pancreatic and intestinal juices, and the perspiration are increased; the proportionate increase being determined by circumstances of temperature and bodily exercise, clothing, etc. The acknowledged benefits from a course of mineral waters are largely due to the increased quantity of water swallowed, and it is found that certain remedies, such as potassium iodide, are more efficacious when given largely diluted with water, and many pharmaceutical preparations must be given diluted, more or less, in order to make them less obnoxious to the palate.

Excessive water-drinking, especially of ice-water, causes digestive disorder; but what constitutes excess is relative, and not absolute, since some persons may, without apparent ill effect, take quantities which would be injurious to others. Used systematically, water increases the watery contents of the stools and favors peristalsis, but excessive water-drinking dilutes the gastric juice and tends to produce diarrhœa. It reduces the density of the blood, and may interfere with the nutrition of the great nerve-centres and of the heart.

The external uses of water produce different physiological effects, in accordance with the mode, duration, and time of application. The primary effects are local or general abstraction of heat and the stimulation of greater or less cutaneous areas. Indirectly, we have stimulation of the nerve-centres and disturbance of function of the vaso-motor system, and the resulting effects upon metabolism, excretion, and assimilation. Hydro-therapeutic measures, apart from their antipyretic applications, are sometimes divided into stimulant and calmative, but no exact line can be drawn between these two classes. Among the former, the full or plunge bath, cold rain or shower bath, the douche, the spray or needle-bath (circular shower bath), sponge or towel bath, of short duration, usually preceded and followed by friction of the skin, are most used. The observations of Winternitz have shown that cold baths increase the absorption of oxygen and the elimination of carbonic acid. A hot bath is a powerful nervous **stimulant.** The stimulating effects of these are shown in the reaction which follows, accompanied by a sense of exhilaration. Where the reaction does not occur, and the patient is blue and depressed after the bath, it fails of the anticipated good effect, and will be injurious, if continued. Some individuals have an idiosyncrasy in this respect, but where this is due solely to being unaccustomed to bathing it can be overcome by a system of graduated baths. By altering the temperature and duration of the bath, the effects may be considerably modified. The **calmative** effects are obtained from the wet-pack, in which the patient is enveloped in a wet sheet and rolled up in blankets; wet compresses; the hot foot-bath; the sitz-bath; the warm bath without motion. The effects noticed are abstraction of heat, diminution of nervous irritability of sensation, and mental activity, also, of the force and frequency of the heart's action. There is a feeling of lassitude and a tendency to sleep. As suggested by Weber (*loc. cit.*), "These forms of application can be modified, and the effects will vary in proportion. Thus, the wet-sheet envelope allows ample variation by using warm or cold water; by using the sheet dripping, or wrung out; by making the sheet fit tightly around the neck; by moving the sheet to and fro; by frequently changing the sheet, etc. The calming and stimulating form may be farther combined by using, first, the wet-sheet envelope, or the woolen-blanket envelope, for a sufficient period to produce perspiration, and then a more or less cold bath or shower bath of short duration." The various forms of hot-air and steam baths, combined with douches and baths of various temperatures, in the forms commonly known as Turkish, Roman, or Russian baths, are powerful hydro-therapeutic helps. Ice may be applied so as to act as a stimulant, or, on the other hand, as an antipyretic and sedative. To obtain the former effect, pieces of ice are applied suddenly to different portions of the surface of the body, thus exciting reflex action and stimulating the vaso-motor nerves. They may also be introduced into the rectum as a general stimulant, as in chloroform or ether narcosis, as recommended by the late S. D. Gross.

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* Quoted by S. Baruch, *loc. cit.*, vol. i, p. 12.

Obstetricians sometimes excite the uterus to contraction in post-partum hæmorrhage by inserting ice into the cavity. Applied over a nerve, ice may produce anæsthesia, or even paresis of its peripheral fibres. Weir Mitchell demonstrated that anatomical changes may be produced by intense cold applied to the nerves, such as congestion with or without sanguineous exudations. Briefly applied, cold produces a rapidly-passing congestion without leaving traces behind, but, if prolonged, the nerve increases in volume, chiefly by dilatation of its blood-vessels. There may be actual effusions in the structure of the nerve, producing more or less paralysis in the parts supplied by it, but they usually disappear, although some of the nerve-fibres may degenerate. "Thus," says Baruch, "we may account for some cases of acute neuralgia, myelitis, and acute spinal paralysis following great temperature effects." All observers are agreed upon one point which is of great importance in clinical hydrotherapy, to wit, "an evanescent thermic application excites, while a prolonged one depresses." There is a more energetic reaction when the transition is abrupt from hot to cold, or the reverse, than where it is graduated.

Irrigation of the mucous cavities of the bodies by large amounts of fluid is a well-known and valued therapeutic measure. Large cold-water enemata have been used as a means of reducing temperature in typhoid fever; injections of warm water break up masses of fæces and cause evacuation of the large bowel; irrigation of the stomach removes mucus and acts as an antiseptic. Hot water is an excellent styptic and antiseptic.

The late Dr. John M. Keating urged the use of large hot-water injections into the rectum, the patient using the fountain syringe before retiring at night, as an assistance in breaking up utero-rectal attachments and reducing backward displacements of the uterus. While making the injection the patient should be in the knee-chest position.

The practice introduced by Krull of treating catarrhal jaundice by means of cold enemeta, has found other supporters. On the first day from 1¾ to 3½ pints of water at 59° F. are injected, and on succeeding days the temperature is gradually raised to 72.5° F. The appetite improves from the first, the hepatic and epigastric sensibility is next relieved and the strength increases. The method is said to succeed in four to six days in recent cases or those of some weeks' duration. The removal of the obstruction is accompanied and followed by polyuria with increased excretion of urea. The injections produce intestinal peristalsis and overcome constipation. They also remove septic matter from the bowel and facilitate the expulsion of calculi.

**Clinical Applications of Water in the Treatment of Disease.**—In the author's work on "Heredity, Health, and Personal Beauty,"* the relationship existing between bathing and health is especially considered in the chapters on "The Bath as Promotive of Health and Beauty" and on "Bathing as Practised in Ancient and Modern Times."

The internal uses of water have already been suggested; it is indispensable both in health and disease. It is owing largely to Dr. Hiram Corson and the late Dr. J. F. Meigs that the practice of refusing water to children during fever has been abandoned; and the fever-thirst is no longer met by small sips of hot water, but the patient is allowed to drink freely of cold water, which reduces temperature, slows the pulse and makes it fuller, favors diaphoresis and excretion, and washes out the kidneys. As a matter of precaution, it is considered advisable to filter and boil water, so as to render it aseptic, especially when epidemics of typhoid fever, cholera, dysentery, and similar diseases prevail. In the treatment of **chronic gastric catarrh**, hot water plays a very important part. Since it is capable of flushing the stomach and washing out the collection of *débris* and mucus, with bacterial and other microbic colonies, it relieves nausea and favors appetite and digestion. Many persons have tried hot water for their **dyspepsia**, as it was a fad a few years ago, and afterward abandoned it because it did them no good. The fact is that they used it improperly, and drank a cup of hot water just as they sat down to a meal. If they had taken professional advice they would have learned that they should take from half a pint to a pint of hot water at least half an hour before each meal, and in some cases an hour is better. The water should be too hot to drink, and should be merely sipped or taken by the teaspoonful. When this has been faithfully done for a short time patients are astonished by their improvement. Nausea disappears, appetite returns, digestion is facilitated, and constipation overcome. It may be necessary to order some compound tincture of gentian or cardamom, or similar stomachic, to be added to the water, in order to insure obediance and perseverance. In the temporary arrest of secretions and suspended digestion accompanying **fever**, water plays an important part in keeping the mouth and throat from being parched, and in removing mucus and epithelial *débris* from the intestinal and urinary tracts. Fever patients should, therefore, be encouraged to drink pure water. The thirst is often better relieved by carbonated waters, such as Vichy or Giesshübler. M. Debove lays great stress upon the administration of water in typhoid fever. M. Maillart, of Geneva, who has particularly studied this subject, writes that water-drinking should be regarded as a special method of treatment. He recommends that the patient should drink five or six quarts of water during the day. This practice has a good effect in reducing temperature, it allays nervous excitability and promotes the action of the kidneys. The quantity of perspiration and urine is augmented, and a large amount of urea is removed from the system. When the stomach contains objectionable material, the simplest **emetic** is water, heated to about 90° F., into which salt or mustard may be stirred if desired; but the water should be supplied to the full capacity of the stomach, since it acts principally mechanically.

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In **summer-diarrhœa of infants** the following method is successful in washing out the intestinal tube: A soft-rubber tube, such as No. 8 Nelaton or Jacques catheter, is gently, but firmly, pushed through the pharynx into the stomach of the child, which is held upright in the nurse's arms. In very many infants this is not a difficult procedure, as they will aid it by sucking the tube. In older children it is more difficult, and had better be avoided. The procedure should not be made in the presence of the mother, nor of anxious friends, if it can be avoided, because the occasional anxious and cyanotic appearance of the baby, although evanescent, and not denoting harm, will interefere with the procedure in many instances. The catheter being lodged in the stomach, it is connected with a fountain syringe, from which simple, boiled water, of 95° F., is poured. The infant will probably vomit, but it is better to disconnect the catheter from the syringe, and allow the water containing products of fermentation, mucus, and undigested curds to escape through the tube. If the tube be not firmly held, it will be vomited (Baruch). This brings up the question of irrigation of the stomach, or **lavage**, as it is called by the French. Lavage is both a diagnostic and a therapeutic agent. The technique, as followed by Baruch, is as follows: The patient is told to eat a hearty meal at 12.30 P.M., and to present himself at 5.30 P.M. for irrigation of the stomach by tepid water. "A long, soft, but firm rubber tube, with open end, and one eye near the latter, is introduced into the stomach. The necessary quantity of warm water (usually two to six quarts) being in readiness, a basin is placed upon a chair in front of the patient. It is well to protect the clothing of the latter by a doubled sheet,—or, what I use in my office, an oil-cloth apron,—secured around the neck and reaching over the knees. Artificial teeth, if present, are to be removed. The patient is requested to sit upright, with his head thrown back. The physician, standing on the right, dips the lower end of the tube in warm water (oil is unnecessary, and injures the tube eventually). Holding it between the thumb and forefinger, he introduces it over the tongue until it strikes the back of the pharynx. The patient is now told to bend his head forward. In the first effort gagging will ensue, but an abundant mucus is secreted in the throat, which lubricates the tube. The patient should be re-assured, if he feels choked or distressed, by informing him that this is the usual effect, and that, if he will keep his mouth well open, he cannot choke, because there is ample room in the pharynx for a larger tube. The physician must refrain from sharing the patient's excitement, and, by his calm demeanor, re-assure him when he, as is often the case, protests that he is utterly unable to do his bidding." If a spasmodic contraction of the œsophagus should occur, the operator should wait a few momnts and have the assistant pour some warm water down the tube. The tube can then gently pass down into the stomach, the distance having first been measured externally and a mark placed upon the tube showing how far it should pass into the mouth. When in position, the warm water is poured into a funnel at the free extremity of the tube, from whence it passes to the stomach. If vomiting ensue, the patient is instructed to lean forward over the basin and allow the vomit to flow out around the tube and partly through it. If the lower end of the tube become blocked up with undigested food, the funnel may be held higher up, so that the water may flow with greater force. After a pint or so, according to the case, has been injected, the funnel end is promptly depressed into the basin, and a reverse current is set up by siphonage from the stomach. This should be done quickly, as suggested by Baruch, **while the water is still flowing,** in order to establish siphonage. A neglect of this simple point defeats the proper emptying of the stomach. This procedure should be repeated until the stomach is thoroughly washed, even if several gallons are required, using no larger quantity at each injection than a pint. The washings are now carefully inspected. If there is undigested food in quantity, it denotes feeble digestion; if there is much gastric mucus floating in the surface, in a thick, tenacious, brown mass, it indicates gastric catarrh; if stringy mucus is present, it generally comes from the throat or gullet; a red tinge to the water suggests that an ulcer is probably present, in which case further use of the stomach-tube should be suspended. In gastric catarrh, systematic washing out of the stomach is of the greatest service, in conjunction with proper diet and the usual remedies. The irrigation may be practised with warm Carlsbad or Vichy water, dilute solutions of boric acid, borax, or nitrate of silver, or simply recently-boiled water, every morning, or every second morning, gradually increasing the intervals as the patient improves. Dr. Baruch cites cases of nervous dyspepsia, in which there was neither mucus nor undigested food in the washings of the stomach, in whom hygienic management and hydrotherapy, externally applied, was successful after all the ordinary remedies had been tried in vain. As regards the time of day, Küssmaul, who, in 1867, introduced this method of treating stomach disorders, selects the morning, before breakfast. Riegel and others assign good reasons for preferring the evening, just before retiring to bed; while Baruch prefers the afternoon, about 5.30 o'clock, a light lunch having been taken at 12.30. In fact, much must be left to the judgment of the physician and his understanding of the requirement of the particular case in hand. A word should be here said about the abuses and possible dangers of lavage and irrigation of the stomach. Cases have been reported of unfavorable results following the use of the stomach-tube, and several cases of boric-acid poisoning have resulted. It is evident that great care should be exercised, and that the operator should proceed cautiously at first, especially where there may be a gastric ulcer, or with a nervous patient.

**Bathing** is a very ancient therapeutic resource. The limits of the present article only permit a very insufficient outline of its applications in medicine. The baths may be general or local. Of general baths, we recognize the plain and the medicated, and, as regards temperature, we have cold, warm, and hot baths. Baths of hot air, or Turkish baths, and of steam (either plain or aromatic) have been already mentioned. The present consideration is restricted to baths by immersion of the body in water, either plain or containing substances in solution. It has been established by recent investigations that absorption through the skin, during a brief immersion in a bath, is practically impossible, and that, therefore, medicated baths are useful only for their direct effects upon the skin. There is little, if any, absorption in a cold bath, and absolutely none in a hot bath. When it is desired to administer remedies for their constitutional effects by the route of the skin, the drugs should not be put into the bath at all, but should be applied to the skin after the bath, upon compresses or by inunction. This will be referred to again, under local hydro-therapeutics.

Baths are called cold, tepid, warm, or hot, according to the temperature of the water. By a **cold** plunge is meant immersion of the body in water below the temperature of 70° F. Anything below 50° F. is considered a very cold bath. In some rare instances of hyperpyrexia, we may even add pieces of ice to the water, as in the treatment of **sun-stroke.** The **tepid** baths, of a temperature of 75° to 95° F., are intermediate between cold and warm baths. The **warm** bath is from 95° to 104° F. Above this is a **hot** bath, and very hot baths may be given up to a temperature of 114° F. As already intimated, the physiological effects depend upon the temperature and duration of the bath. Under ordinary circumstances, when no time is mentioned, the duration depends upon the objects sought to be attained by the baths and personal convenience. Prolonged immersion is sometimes practised in some surgical cases and in skin diseases. The **cold** bath should be brief, as the rule, and followed by friction with the flesh-brush or coarse towel. This expedient is most valuable in invigorating the system, and is utilized in the treatment of catarrh, in conjunction with local treatment. Some patients bear cold better than others, but prolonged immersion is depressing, owing to continued loss of heat. The secondary effects of cold bathing—which accelerates tissue-change, augments the excretion of carbon dioxide and of urea from the system, and improves the appetite—are used to advantage in many chronic disorders, and particularly in **lithæmia** and **rheumatism.** Cold sea-bathing has an important part in favoring **neurasthenia,** especially in children; but in many instances it should be preceded by a graduated system of warm bathing, until the patient is strong enough to bear the shock of the plunge. Where motion of the body, as in swimming, is combined with the cold bath, the depressing effects are less than when the subject is kept quiet. The hygienic effects of a stay at the sea-shore also enter into the advantages of sea-bathing. Children afflicted with rachitis are generally improved by a sojourn at the sea-shore and the practice of sea-bathing. The **warm** bath is that generally resorted to for cleansing purposes, and is accompanied by frictions of the skin. It is without shock; it causes a moderate increase of capillary circulation, and scarcely affects the pulse. As the stay in a warm bath is generally longer than in a cold bath, the loss of heat may be actually greater than from a cold bath; hence the aphorism of Hippocrates, that "a cold bath warms and a warm bath cools." This is the form of bath which is generally resorted to in the treatment of fevers, and which will be referred to in detail in discussing the Brand method of treating typhoid or enteric fever. **Hot** baths exert a powerful stimulating effect upon the nerves and blood-vessels of the skin, and are used in narcotic poisoning and in overcoming a tendency to coma in low fevers. Hot water injected into the rectum has been found useful in overcoming shock due to loss of blood or surgical operations. Professor Baelz, of Tokio, recommends the hot bath as a valuable measure in the treatment of capillary bronchitis, broncho-pneumonia, rheumatism, nephritis, and in the beginning of menstruation when accompanied by uterine colic.

Caution is to be observed in adapting the bath to the condition of the patient. Cold baths are fitted for the vigorous and robust, but even in them, as pointed out editorially in the *British Medical Journal*, it may be carried to excess and become injurious. Cold bathing every morning throughout the year may be conducted in such a way as to be beneficial, viz.: if the plunge be brief and be followed by friction of the skin and prompt dressing. But because it can be carried on with advantage by one person who reacts well after it, it does not follow that another can do it with impunity, especially if he finds that reaction is slow after the bath. In the latter a moderately warm plunge-bath or shower-bath might be borne well and be followed by beneficial results.

Open-air bathing in winter is not likely to have many advocates in this uncertain climate, but it appears that it finds some defenders in England, where school-boys, who do not like to be outdone by their seniors, we learn, are in the habit of taking a cold bath before the morning-school. This is apt to be injurious to the weakly ones and to retard development in the strong unless followed by running or other active exercise, to restore the circulation. Cold baths should never be taken when exhausted or directly after a full meal, or if there be reason to suspect congestion of any internal organ. The anæmic and debilitated may combine the advantages of both the tepid and the cold bath by immersion in or sponging with warm water, followed (while still standing in warm water) by the rapid application of a sponge, wet with cold water, to the general surface or to the throat and chest. Asthenic persons are often unable to take a full bath, and subjects of vascular degeneration or heart disease should only use warm water. The excessive use of decidedly warm or hot baths is relaxing to the system and debilitating.

The treatment of **typhoid fever** by Brand's method involves the administration of a bath at 68° F., given every three hours, where the rectal temperature is 102.2 degrees or over, and lasting about fifteen minutes. With some modifications, this form of antipyretic treatment of typhoid fever is now in general use, and a very marked improvement has been observed since its introduction. In the *Practitioner* for March, 1891, Dr. F. E. Hare, of Brisbane, analyzes two series of cases of typhoid fever,—the one including eighteen hundred and twenty-eight cases and treated expectantly, the other comprising eleven hundred and seventy-three cases and treated with cold baths. Dr. Hare deals most effectually with possible objections to his statistics. He shows that the treatment has no effect upon the occurrence of perforation and hæmorrhage beyond rendering the latter less dangerous; that the death-rate from exhaustion and from pulmonary and cerebral causes is diminished, especially in cases of early admission to the hospital; and that the prognosis becomes even better in women, since they are less liable to perforation and hæmorrhage than men. The lethal influence of the intestinal lesion is lessened under this treatment, by moderating the diarrhœa and by sustaining the strength of the patient. Brand's rules and cautions as to contra-indications were observed. Dr. Hare incidentally remarks that quinine is of much service as a cardiac stimulant in simple pyrexial cardiac failure. The author concludes by saying that hospital mortality may be greatly reduced—upward of 50 per cent.—by the cold-bath treatment; but that it can hardly fall below 5 per cent., since the death-rate from perforation and hæmorrhage amounts fairly constantly to 4½ per cent. As the result of the different liability of the sexes to these accidents, the prognosis under the bath treatment is vastly more favorable in females than in males, as above stated.

As this method requires a portable bath-tub, or subjects the patient to considerable disturbance of body, which is opposed to the first principles of treatment of typhoid, various methods have been devised to overcome this objection. The patient may be placed upon rubber cloth and the edges lifted up in such a way as to make the patient lie in a hollow, which may be partly filled with water of any desired temperature. Niemeyer's method is somewhat similar, the patient being enveloped in a wet sheet, and water, at the temperature of 70 degrees or less, is then applied by means of a watering-pot or rose-spray. Prof. Da Costa prefers cold sponging, repeated every hour or two when the temperature is over 102 degrees. The following is a method advocated by Dr. F. Peyre Porcher, of Charleston, S. C.:

"1. A soft towel, folded, is soaked in a basin of iced water, then wrung out and applied over the forehead and temples.

"2. The palm of one hand and the arm are sponged off with another towel, which has been dipped in the cold water and wrung out.

"3. The towel which has been left upon the head is turned and re-applied, so as to have the cold surface next to the skin.

"4. The other hand and arm are treated as was the first.

"This process, strictly followed, is continued for fifteen, twenty, or thirty minutes, or until such time as the surfaces have become thoroughly cooled and blanched, when it may be discontinued,—to be renewed whenever there is a rise in the surface-heat. Sometimes, if it does not cause fatigue, both hands and arms, if hot and dry, are allowed to remain submerged, or be bathed directly in the cold water."*

The late Dujardin-Beaumetz was an advocate of the hydropathic treatment of typhoid fever, but was opposed to the cold bath. He summed up Brand's method as follows: "You must administer baths of 64° to 68° F., of fifteen minutes duration, from the fifth day of the fever; these must be repeated day and night, every three hours, as long as the temperature of the rectum exceeds 102° F." In applying rigorously this treatment, so simple in appearnce, Brand considered himself warranted in affirming that "every case of typhoid fever, treated regularly from the beginning by cold water, will be exempt from complications and will get well." The method of Brand is carried out rigorously at Lyons by Dr. Glenard, who reports such good results in his service that the method has extended to all the other hospitals of Lyons. Ziemssen reports a great reduction of mortality in Germany. At the same time Schmidt, of Erlangen, and others have shown that a rigorous application of the cold bath to typhoid-fever patients is not without its dangers, and the death-rate may be actually increased by it. Dujardin-Beaumetz, after a review of the question, asserts that "the method of Brand is impracticable in the majority of cases and outside of military practice," and this applies to hospital as well as private practice. He bases this statement upon the fact that it is not possible to begin the practice as early as the fifth day in all cases, because they never enter the hospitals so early, and because we cannot be sure of our diagnosis till after the seventh day. Moreover, he justly states that "we cannot, without danger, subject all our fever patients to a rigorous and severe method, and where we are ignorant of the cause even of the febrile process." Since the cold bath may determine profound congestions, he declares that Brand's method is not free from danger, and is itself a cause of not a few complications, especially pulmonary congestions and inflammations. As regards intestinal hæmorrhage, he believes that in certain cases the cold baths may favor these hæmorrhages in patients who are predisposed.

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* Transactions of the Association of American Physicians, vol. i, p. 29.

In summing up, he says: "I consider the exclusive method of Brand, and the rigorous and mathematical rules which he has formulated, as deserving to be banished from the treatment of typhoid fever, and for this reason especially: because it requires, in order to derive from it all the results which it promises, to be applied before the diagnosis can be certain; for, employed later, this system only gives, according to the acknowledgments of the most zealous partisans, results comparable with those of other therapeutic methods, and with greater danger to the patients. . . . In fact, we have, for the treatment of certain manifestations of typhoid fever, hydro-therapeutic means much less dangerous and quite as powerful,—not, perhaps, from the point of view of hyperpyrexia, but from that of the other symptoms of typhoid fever; for, in my opinion, the advocates of refrigerant medication have committed an error in vociferating, 'The hyperpyrexia!—Behold the enemy!' The hyperpyrexia, as Peter has well said, does not constitute all the danger of the disease, of which it is only one of the manifestations."

Dujardin-Beaumetz* preferred the tepid bath or the **wet pack**, applied as follows: "The patient, in a state of nudity, is wrapped, from head to foot, in a sheet or blanket wrung out of ice-cold water. It is well, as a preliminary step, to have a rubber blanket spread upon a mattress; over this you place the wet sheet, in which you wrap your patient. Liebermeister advises that this envelopment should be continued for ten minutes; for my part, I prefer a shorter duration (of a minute or so), after which the patient is taken from the wet sheet and removed to his bed. If I prefer wet wrappings, of short duration, to the practice of Liebermeister, it is because I do not wish to obtain refrigeration from these envelopments, but only a regulative modification of the nervous system, and this effect will be the more marked the shorter the duration of the cold application. This is one of our most powerful modes of treatment, in cases of typhoid fever of ataxic and adynamic character. . . . Foltz has recently added cold lavements to the refrigerant medication. These lavements of water, at 50° F., lower the temperature of patients—in a feeble manner, it is true, but still appreciably,—and this is a fact worthy of being remembered.†

The principal local applications of hydrotherapy consist of affusions or douches, compresses or partial packing, and local immersion. There are a variety of methods of administering douches,—the shower-bath; the douche proper, in which a column of water falls or is projected upon the body; the needle-bath, in which several rings, at different levels, discharge minute streams of water, from all directions, upon the body; and the movable jet or spray. Where the force of the water is rather great, we should avoid douching the head. The douche may be, like the full bath, cold, temperate, or hot; but it has this advantage over the full bath, that the temperature may be abruptly changed, thus producing rapid alternations of temperature, which are decidedly stimulating to the nervous system, both central and peripheral.

In the so-called "Scotch douche,"—a shower-bath, in which the temperature, at the beginning, is about 86 degrees, and is gradually raised to 122 degrees, which is about as hot as can be borne,—this is followed immediately by a douche about as cold as ice. The duration of the douche should be very brief (ten to twenty seconds), and should be preceded by active exercises, to produce action of the glands of the skin. It is, therefore, a measure better adapted to vigorous persons than invalids. It can be utilized, however, in the manner described upon the preceding page as the method of Niemeyer. The cold shower is of service, when directed against disorders situated in various organs of the body, and, when followed by vigorous friction, or, as Gross recommended, whipping with the fringed edge of a towel, it is a powerful nutritive stimulant. The cold douche to the lumbar region stimulates the kidneys in suppression of urine; but in advanced Bright's disease the wet pack is better, on account of the free perspiration which it induces.

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* Clinical Therapeutics, by Professor Dujardin-Beaumetz, p. 383. Translated by E. P. Hurd, M.D., Detroit, 1885.

† Clinical Therapeutics, *loc. cit.*, p. 387.

Dr. Hiram Corson, of Pennsylvania, highly recommends cold douche in the delirium of **scarlatina** and other eruptive diseases, the water being poured from a pitcher, elevated a foot or two, and sufficient in quantity to reduce the temperature and delirium. The influence of cold water in reducing prolonged hyperpyrexia in scarlatina is admirably exemplified in the circumstantial history of a case published by Dr. Ch. Talamon, of Paris.* A high temperature with violent delirium and alarming adynamic condition had existed for seventeen days and cold affusions had been employed with temporary good effect when the systematic use of the cold bath, according to the method of Brand, exerted the first positive influence upon the fever, and was the only means which succeeded in definitely overcoming the hyperpyrexia. In the words of the reporter, "it may be said that the cold baths literally resuscitated this patient, and we are convinced that, had they been employed from the beginning, we should have obtained, in the early days of the disease, the result which was delayed until the twentieth day."

M. Levestre is a strong advocate of the use of cold baths in the pneumonia of children. He states that the temperature is reduced after each immersion while the pulse and respiration were diminished in frequency. Defervescence usually occurred before the seventh day.

Dr. Thomas J. Mays, of Philadelphia, is a firm advocate of the application of ice-poultices in the croupous pneumonia of adults. The affected area is surrounded by rubber ice-bags well wrapped in towels and another is placed upon the head. Other writers have borne testimony to the value of this method of treatment. The cold douche to the spine is useful in chorea and in many other disorders of the spinal chord. The application of ice to the spine, for sea-sickness, chorea, etc., will be referred to in the chapter on "Cold and Heat as Therapeutic Agents." The local application of moisture is largely employed in medicine, in the form of stupes, cataplasms, or poultices, and compresses; especially when used in connection with heat, it favors local hyperæmia and hastens the process of suppuration in abscesses and boils. This method is also useful in relieving pain and relaxing tissues, as where joints have become stiffened. Cold compresses, especially when some agent is added to favor evaporation, as alcohol, are useful in various forms of inflammation. A common resource in pharyngitis, tonsillitis, and nflammation of the throat attending scarlet fever and diphtheria, is the application of wet compresses, which may be dipped in ice-water, as recommended by Dr. Hiram Corson.

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* *La Médicine Moderne*, September 15, 1892; *The Medical Bulletin*, November, 1892, p. 427.

To review the therapeutic applications of water, we would place at the head of the list the hydriatic treatment of **fever.** Dr. Baruch has pointed out* the principal reasons why this method is not in general use, as (1) it is believed by many to savor of quackery; (2) the difficulty of applying its principles, and necessity of apparatus; (3) the necessity and difficulty of an exact technique; and (4) the objection of patients and the natural aversion of some people to water. The main obstacle, however, is probably the absence of hydropathic teaching in the medical colleges, and want of appreciation by physicians of the advantages of this mode of treatment. Under the direction of the leading clinicians of Europe and this country, a rapid revolution is occurring in medical practice, and the expedients of hydropathy are coming into more general use as the knowledge of their utility and safety becomes more widely diffused among physicians and the community. In **typhoid fever,** some form of bathing is now universally resorted to for the relief of hyperpyrexia, although, as Dujardin-Beaumetz insisted, the effects of the bath upon the functions of the nervous system are of greater importance than the mere abstraction of heat, in favoring recovery and diminishing liability to complications. In scarlatina, measles, and other exanthemata, the wet pack is useful in bringing out the eruption, relieving restlessness, and reducing fever temperature. In chronic metal poisoning (lead, mercury, arsenic), the increased perspiration favors elimination. In muscular rheumatism and lithæmia, and various forms of chronic rheumatic inflammation of organs, the wet pack and vapor-baths are very useful. A convenient method of obtaining a vapor-bath, without apparatus, is to strip the patient and envelop him in a wet sheet, then seat him upon a cane-seat chair. Under the chair, upon the floor, is placed a small alcohol-lamp, over which is a small receptacle filled with water. After lighting the lamp, the patient is covered with blankets, which pass from his neck to the floor, thus retaining the heat. In a few moments, perspiration will begin to come out, and profuse sweating will ensue. After ten or fifteen minutes, the patient is allowed to lie down upon a bed, and is thoroughly dried with towels, followed by friction. If desired, medicinal substances may be combined with this bath. For instance, some pine-needle-oil (oil of pumilio pine) may be added to the water. Some sulphur may be burned at the time that the skin is perspiring freely, or 10 or 20 grains of calomel or red oxide of mercury may be vaporized by placing them upon a metal plate, over the lamp, as a substitute for the water-pan after free diaphoresis has been produced.

Another method of causing diaphoresis, which is a combination of hot air and moisture, is conveniently used as follows: A small tin pipe (like a rain-spout) is obtained, which is rounded in the middle so that the ends are in planes at nearly a right angle to each other. The patient is placed in bed, upon a rubber sheet, covered by a blanket. The bed-clothing is brought tightly around the neck and shoulders, but lifted from the remainder of the body by means of half-hoops, or other means of elevating the bed-clothing, so as to make it into a hot-air chamber. The pipe is attached to the foot of the bed so that one end enters the cavity of the hot-air chamber and the other is outside, directed downward. Under the latter is placed a lighted alcohol-lamp, so that the heated air from the flame will pass into the pipe and be carried under the bed-covers. The patient will be made more comfortable by having a compress, wet with cold water, applied to his forehead during this period. After profuse perspiration has been excited and continued for the desired time, the patient is rubbed down and dried as before. This is of great advantage in chronic rheumatism, Bright's disease, uræmia, and similar conditions.

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* *Journal of Balneology*, March, 1892, p. 2.

In **gouty** or **rheumatic inflammation**, restricted to certain joints, the local compress is serviceable, and good reports have been made of the application of 10-per-cent. solutions of salicylic acid or salicylate of sodium to the joints. By combining electricity with these compresses absorption is favored, and remarkably good results have been obtained, as has been already stated in the article upon Electricity under "Electrolysis and the Cataphoretic Action of the Galvanic Current."

In **syphilis** and **skin diseases** the bath is indispensable, and the application of various forms of hydrotherapy is set forth in more detail than is permissible here in the author's work* on "Diseases of the Skin."

The results obtained at the Montefiore Home by Dr. Baruch, in the treatment of **phthisis** by hydriatic measures, have been so successful that further trial of this method is recommended. The technique of these procedures varies with each case. Brief applications of low temperature, as by the douche or rain-bath, the wet pack, or rapid ablutions, are followed by rapid reactions, and, if well borne, are exceedingly useful as tonics; while, on the contrary, in cases suffering from elevated temperatures and great debility, more gentle procedures and higher temperatures are required. Dr. Baruch warns against too cold applications, which are better indicated in a febrile or mildly febrile condition. He gives the patients a thorough cleansing with soap and warm water upon entering the hospital, after which a day is allowed to elapse. "The patient is now wrapped snugly, quite naked, in a woolen blanket, so that his entire body is excluded from air; other blankets are piled over him; the windows are opened, and he is given a small glass of iced water every ten minutes. Having lain in this position an hour, now one part of the body is exposed and bathed as follows: A basin of water at 75 degrees is ready, into which the attendant dips his right hand, covered by a mitten or glove of Turkish toweling. With the wet glove the face is well bathed. Now, one arm is exposed and rapidly washed and rubbed, then dried and replaced under the blanket. Other parts are then successively treated. At the termination of this ablution the patient is rapidly rubbed all over with a coarse towel. The treatment is repeated daily, the temperature of the water being reduced 2 degrees on each occasion."* The next step is the dripping-sheet. "The patient, standing in a tub of water at 100° F., has a sheet, dipped in water at 70° F., thrown over his head and body from behind, and is wrapped completely and snugly in it. The attendant now passes his outstretched hands over successive parts of the body, with some pressure on the sheet. He rubs the **sheet**, not **with** the sheet. One or more pitchers of water, 5 to 10 degrees colder, are thrown upon the parts that have been subjected to friction. The sheet is removed and the patient thoroughly dried. This method requires great care and skillful application. Its success or failure depends upon ascertaining by previous treatment the reactive capacity of the patient. The most useful hydriatic procedure in phthisis, however, is the rain-bath. Unfortunately, this finely-divided douche can only be administered in institutions. The patient stands within a frame constructed of six semicircles of inch tubing, the upper one on a level with the clavicles. Each tube has three lines of fine perforations, the upper one directed upward, the middle straight forward, the lower downward. The water should have a fall of not less than forty feet. The temperature adapted to the average case of phthisis is 65° F. Here the pressure with which the water strikes the body affords a kind of massage, which assists in producing reaction even in feeble individuals. But it should not be applied without previous training of the skin, as above described. The rain-bath is an apyretic of great value if its temperature is not below 60 degrees nor above 70 degrees; it is a stimulant and tonic if between 55° and 65° F. The skin should become pink under it, and the patient must not be chilled by it; at least, any coldness he may experience should disappear after he is dried. **This, indeed, is the test of all hydriatic procedures.** Decided chilliness continuing after thorough drying and friction is an evidence of improper selection of the temperature, duration, and method of the bath. These should be modified as indicated by their effects." The progressive increase in weight and improvement of general condition in phthisis are accompanied by a diminution in the expectoration and the numbers of the bacilli.

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* "A Practical Treatise on Diseases of the Skin." Second Edition. New York: D. Appleton & Co., 1892.

**Hydropathy in Nervous Diseases.**—In many nervous affections disturbances of function are due to some obscure lesion or fault of nutrition, which can be removed or amended by judicious hydrotherapy. Professor Erb says: "Cold and cool baths, in various forms, belong to the most important therapeutically active agents in the field. This method has, since it has been more carefully studied and more rationally pursued, made notable advances. Its results in all possible forms of chronic nerve-troubles are extraordinarily favorable. There are few remedies which have an equally powerful influence upon the nervous system."† An excellent review of this subject is contained in a lecture by Prof. Charles L. Dana, M.D., of New York, delivered before the Post-Graduate College of that city.‡

The various forms used by the neurologist are:—

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* *Dietetic and Hygienic Gazette*, March, 1892.

† Article by Professor Erb, of Heidelberg, on "Diseases of the Nervous System," in Ziemssen's Cyclopædia.

‡ *The Dietetic Gazette*, December, 1891, p. 237.

1. General hydrotherapy, tonic hydrotherapy, sedative hydrotherapy, indifferent baths for mechanical purposes.

2. Local hydrotherapy.

*Tonic Hydrotherapy.*—For purposes of stimulating nutrition and increasing vaso-motor tone we employ cold plunges, the rain-bath or shower, the jet, cold sponging, cold sitz-baths, cold sheets, local applications of ice or cold compresses, or cold rubbing, ice-bags, brine-baths, brief cold packs, and sea-bathing. The technique of these is as follows:—

**The Cold Plunge.**—The bath is filled with water, at from 60° to 70° F. The patient steps in, immerses his body, and at once jumps out and rubs himself vigorously, or is rubbed by attendants, until reaction occurs.

*The rain-, jet-, shower-, or needle-bath* requires a form of apparatus which delivers the water in fine jets, either vertically or laterally, against the body. The force of the water is an important feature, and both it and the temperature should be properly regulated. In the rain-bath the patient stands in a tub containing some warm water, and the shower is directed upon successive portions of his body. The water may be at first moderately warm and gradually made cold, or it may be cold from the beginning. Where it is desirable to give a shock to the peripheral nerves the latter is preferable, or there may be a succession of showers, alternating hot and cold. Rain-baths should not continue beyond one or two minutes. A solid jet of cool water may be thrown or allowed to fall with force upon the back of the patient, either from a tap or a hose. In the latter case the jet may be thrown from a distance of several feet.

*Cold sitz-baths* are taken, at a temperature of 70° to 80° F., from twenty to thirty minutes. The **cold sheet,** or **drip-sheet,** is used by wringing a cotton sheet out in cold water, and wrapping it suddenly about the standing patient, who is then vigorously rubbed.

*Ice-bags* may be kept in contact with the spine, in the lower cervical or upper dorsal regions, for one or two hours, once, or several times, daily.

*The half-bath and wash-off* consists of a tub partly filled with water at a temperature of 65° to 80° F. The water only half covers the reclining body. While lying in it the patient is vigorously rubbed. A cold cloth may be laid on the head. After five or twenty minutes affusions of colder water are poured over the shoulders and along the spine.

*Brine-baths* contain about 2 per cent. of salt (sodium chloride). They are given, at a temperature of 100° F., from twenty to thirty minutes daily; or four baths of 70° F. may be given for five or ten minutes, the patient exercising himself or being rubbed in the meanwhile.

The physiological effects of these different forms of hydrotherapy should be kept in mind. Cold applications produce a local contraction of the blood-vessels, followed by dilatation. There is usually increased tissue-metamorphosis, increased secretion of urine, increased absorption of oxygen, and increased excretion of carbonic acid. In non-febrile persons cold applications abstract some heat, but they also stimulate the heat-producing centres, so that the total effect is to increase the heat of the body. Only very cold baths lessen heat production as well as excretion of carbon dioxide.

Cold baths at first accelerate and then tend to retard pulse and respiration. Cutaneous sensibility is at first increased. After a cold bath there is a sense of exhilaration and increased muscular power, provided the bath be not too cold or too long continued. The duration necessary to produce a reaction varies with different people, and some weak and sensitive patients never can be made to react. Cold baths, systematically taken, furnish a kind of vasomotor gymnastics. The neuro-mechanism controlling the blood-vessels becomes more supple and the tendency to local congestion of the viscera and mucous membranes is prevented.

The shower and jet furnish the most valuable means of securing tonic effects in nervous disorders. These are not used with cold water alone. The temperature may be gradually changed from 95 degrees or more down to 60 degrees or less, or the hot and cold may alternate. In this way, says Dana, tonic effects can be obtained even with very feeble persons.

**Sedative Hydrotherapy in Nervous Disorders.**—The sedative baths are the lukewarm bath, the wet pack, Turkish and Russian baths, the hot sitz-bath, pedal baths, compresses and fomentations, and hot-water bags. The following is the technique:—

*The lukewarm baths* are usually at a temperature of 95 to 98 degrees, and are given from ten minutes to half an hour, daily. If a slight tonic effect is desired also, the patient should receive an affusion afterward, basins of cold water at 60 or 70 degrees being poured over his shoulders. Medicaments, such as salt or pine-needle extract, may be added to the bath with advantage.

*The wet-pack:* A large, thick blanket is spread upon the bed, and over this a linen sheet, wrung out of cold water (40 to 60 degrees). The nude patient lies upon this, and the sheet is then smoothly wrapped about him, the head and feet not being included. The sheet is carried between the legs and made to lie evenly in contact with the body. Then the blankets are folded over him, and other blankets may be piled upon these. Sometimes it is well to place hot-water bottles at the feet and a cool compress on the head. The patient lies in this pack from thirty to forty-five minutes, and is then rubbed off. A cool affusion may be given first. To increase diaphoresis some hot infusion may be administered during the time the patient is in the pack.

*Turkish* and *Russian baths*, or hot-air and steam baths, as given in establishments devoted to the purpose, should have professional supervision, and the temperature, ventilation, duration, and after-treatment, by jet, shower, or plunge, carefully adapted to the individual case. A shower or cold affusion to the lower spine is an excellent stimulant to the kidneys.

In a *hot sitz-bath* the patient sits in water at a temperature of 100° to 125° F. for twenty or thirty minutes. Salt or mustard may be added. This is an excellent sedative in dysmenorrhœa; or *hot compresses*, consisting of flannels wrung out of hot water and covered with dry flannels and a rubber cloth, may be substituted in local pains and inflammations.

The hot compress is often effective, when applied in this way over the abdomen, for the relief of insomnia. *Hot sprays and douches* are used for similar purposes. The hot spinal bag and hot-water bags for the feet should not be applied at a temperature of over 120 degrees, and should be enveloped in flannel and not placed in contact with the skin.

Warm baths increase heat radiation and conduction, and thus lower bodily temperature; the warm, moist pack, followed by sponging with tepid water, is the most convenient method of applying the water. On the contrary, the bodily heat may be raised in the pack by applying hot-water bags to the surface and adding blankets. "Warm baths increase the circulation of the skin, lessen cutaneous sensibility, withdraw blood from the central organs, increase the exhalation of carbon dioxide, but lessen respiratory activity, on the whole. Nitrogenous metabolism is increased from 2 to 3 per cent., and more urea is excreted. Pulse and respiration are increased. Nervous excitement is lessened, and the general effect is to cause sedation and abating of languor." *

The wet pack is a most useful sedative in **neurasthenia** and **insomnia**, and may take the place of medicinal sedatives, like the bromides. It should be given three or four times weekly or for a short time daily. The lukewarm bath ranks next in its sedative efficacy. Dr. Dana also points out that applications of water to the feet and abdomen especially effect the intra-cranial circulation, while those given to the thigh and wrists affect the pulmonary circulation, in each case cold causing congestion, and heat anæmia, of the distant parts. [If this be a physiological fact it would oppose the method of Dr. Porcher, given upon a preceding page, for the reduction of bodily temperature in typhoid fever.] Cold to the spine is believed to cause, at first, constriction and, later, dilatation of the thoracic, abdominal, and pelvic viscera; heat has the opposite effect. Hence, cold applications are used to relieve **cold feet** and also anæmic conditions of the viscera.

In **neurasthenia** Dr. Dana recommends wet packs and half-baths, followed by shower, jet, or plunge. For weak, sensitive, and anæmic women he prescribes, first, dry, hot packs for a week, then wet packs, and, finally, the drip-sheet or shower-bath.

In **epilepsy** dry and wet packs may be given; but the best method for a fairly robust person is that originally described by Fleury. This consists in giving simultaneously the rain, shower, and the jet. The patient, standing in the shower, receives a jet of water on the posterior surface of the body for fifteen seconds; then the jet alone for fifteen seconds; finally, the jet alone on the anterior surface of the body for thirty seconds.

In **hysteria** the rain-shower and the jet are usually most efficacious.

In **locomotor ataxia** lukewarm baths, with pine-needle extract, or half-baths, with affusions, are indicated.

In **peripheral pains** from neuritis and neuralgia the continuous application of ice-bags is often efficacious; and hot sand- or water-bags are sometimes applied continuously to the spine for one or two hours, with the purpose of increasing the circulatory activity of the cord.

Cold applications to the spinal column are resorted to with benefit in **chorea** and other spasmodic disorders, such as **persistent vomiting, hydrophobia,** etc. The ice-bag, to the scalp is of the highest service in **cerebral meningitis** and **cerebritis,** whether primary or secondary; and it relieves the **headache** and **delirium** in the specific fevers.

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* Dr. Dana, *loc. cit.*, p. 238.

In two cases of tetanus accompanied by high temperature Rivière obtained good results from the use of cold baths which reduced both the fever and spasms and the patients recovered. Opium and chloral had failed in each case to produce any decided amelioration.

## MINERAL SPRINGS.

The subject of mineral springs has relations of the most intimate kind with balneology and also with climatology, and naturally comes up for consideration in close connection with the preceding section, in which the therapeutic applications of water were dwelt upon. At the very beginning it is proper to direct attention to the fact that the distinction between water and medicinal water is not absolute, but simply one of degree. Pure water only exists in the laboratory; in nature water is always, to a greater or less degree, contaminated with various soluble substances, which it dissolves from the earth's crust or absorbs from the atmosphere. The degree of contamination or impregnation depends upon certain circumstances which are largely of a local character, the springs of one neighborhood containing mineral and other ingredients, which are constantly present and characterize them, so as to distinguish and make them different from other springs, either of the same or of a distant locality. Therefore, degrees of purity are recognized, while absolute purity is not expected; and where the mineral contamination is sufficiently great to make the water produce therapeutic effects, we can divide the waters into classes in accordance with such effects. It is a matter of observation that springs and streams of water, in addition to the natural contamination, may contain, by accident, or design, other constituents, which are called pathogenic organisms or disease-germs, owing to their effects upon the general health of those using such water. These come under the general head of pollution. Thus, organic refuse, excreta of animals or human beings, sewage and waste from manufactories, etc., pollute a water-supply, and are a frequent source of epidemics. With these pathogenic forms of contamination the present article has nothing to do further than to give a mere reminder of a lurking danger which may unexpectedly be encountered at health resorts and, with this very important exception, among the most sanitary surroundings. As every intelligent person, and especially every practicing physician, should be able to pronounce upon the presence or absence of suspected impurities, and as physicians are often called upon for an opinion as regards the wholesomeness of water, the following tests may enable him to come to a decision. The clearness, transparency, and general appearance of the water, as compared with a sample of distilled water. The odor that it may have is developed by slightly heating some in a small flask and smelling it; the odor may or may not indicate the presence of deleterious substances. Color and turbidity may depend upon vegetable or mineral impurities which are not necessarily prejudicial to health. Should these be absent it must not be at once decided that, because the water is clear, transparent, and odorless, it is wholesome; on the contrary, the most attractive-looking water may contain dangerous pollution, and be entirely unfit for use. The total solids of a good drinking-water should not exceed 25 to 30 parts in 10,000, the character of the solids of course, affecting the results upon health. The total solids are determined by evaporating a certain quantity of water to dryness and weighing the residue. This may be subsequently subjected to chemical examination, if desired to have a complete analysis of the water. Any gases which may come off from the water should be collected, measured, and identified. Qualitative tests for organic matter with potassium permanganate solution, and for chlorides by silver nitrate, for nitrates with pyrogallol, and for ammonia by Nessler's reagent are usually resorted to. If the permanganate be decolorized after standing a few hours it indicates presence of organic matter, but not necessarily of animal origin; it may be vegetable and harmless. If a solution of silver nitrate causes an abundant precipitate of chlorides, this may be due also to mineral contamination, as well as to animal excreta. The determination of nitrites and nitrates is of more importance, since they lead to the suspicion of sewage contamination. "They are the resultants of oxidation of nitrogenous organic matter, and although water containing them is not necessarily dangerous, their presence should render a thorough examination of the source of supply imperative." The pyrogallol test is applied as follows: Put 2 cubic centimetres of pure sulphuric acid in a small test-tube and add 1 cubic centimetre of water to be tested. To this mixture is added 1 drop of a solution of pyrogallol (65 centigrammes in 30 cubic centimetres of distilled water, acidulated with 2 drops of sulphuric acid). The water becomes colored a dark amethyst or wine-brown if the salts are present. The depth of color indicates approximately the amount of the impurity. A very delicate test for nitrous acid or nitrites is that with potassium iodide and starch. Three hundred and fifty to 600 cubic centimetres of water, in a flask, are acidulated with a few drops of dilute sulphuric acid, and a little solution of iodide of potassium added. About 2 grammes of freshly prepared starch are added, and the mixture shaken. If nitrous acid be present the iodide is decomposed, setting free the iodine, which combines with the starch, causing a blue color.*

Bacteriological tests are now made by all experts in water analysis, and such determinations are absolutely necessary in order to decide positively upon the potable quality of any water-supply. A rough bacteriological test can be made by placing a sample of the water in a clean flask and filling the neck with absorbent cotton in place of a cork. The flask is now placed in a warm situation (say, at a temperature of 90 to 100 degrees) for ten or twelve hours, and then examined. If it become cloudly and develop a putrid smell, it should be regarded as unwholesome and some source of pollution suspected.

The mineral poisons, especially the common metallic forms,—lead, copper, zinc,—are easily recognized by the hydrogen sulphide test, and arsenic by Marsh's test. In making the former test, about half a pint of the water is placed in a tall glass and acidulated with hydrochloric acid. To this an aqueous solution of hydrogen sulphide is added, and if, upon looking downward through the column of water, a brownish or blackish coloration or precipitate is seen, either lead or copper may be present. The precipitate is collected and dissolved in hot, dilute nitric acid. To this a solution of potassium bichromate is added, and if a yellow precipitate is thrown down which is soluble in caustic potash the metallic contamination is lead. If the precipitate thrown down by the hydrogen sulphide is dissolved as above, and ammonia added, the appearance of a blue color will indicate the presence of copper. To detect zinc the hydrogen sulphide precipitate is treated with caustic soda, again filtered, and hydrogen sulphide added to the filtering liquid. A white precipitate indicates the presence of zinc. The following summary is given of the inferences to be drawn from these tests by Parkes *:—

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* Geo H. Rohé, "Text Book of Hygiene," p. 74. Philadelphia, 1890.

If chlorine be present in considerable quantity, it either comes from strata containing sodium or calcium chloride, from impregnation of sea-water, or from admixture of liquid excreta of men and animals. In the first place, the water is often alkaline, from sodium carbonate; there is an absence, or nearly so, of oxidized organic matters, as indicated by nitric and nitrous acids and ammonia, and of organic matter; there is often much sulphuric acid. If it be from calcium chloride, there is a large precipitate, with ammonium oxalate, after boiling. If the chlorine be from impregnation with sea-water, it is often in very large quantity; there is much magnesia, and little evidence of oxidized products from organic matters. If from sewage, the chlorine is marked, and there is coincident evidence of nitric and nitrous acids and ammonia, and, if the contamination be recent, of oxidizable organic matters.

"Ammonia is almost always present in very small quantity; but if it be in large enough amount to be detected without distillation, it is suspicious. If nitrate, etc., be also present, it is likely to be from animal substances, excreta, etc. Nitrates and nitrites indicate previously existing organic matters, probably animal, but nitrates may also originate from vegetable matter, although this is probably less usual. If nitrates largely exist, it is generally supposed that the contamination is recent; the coincidence of easily oxidized organic matters of ammonia and of chlorine, in some quantity, would be in favor of an animal origin. If a water give the test of nitric acid, but not of nitrous acid, and very little ammonia, either potassium, sodium, or calcium nitrate is present, derived from soil impregnated with animal substances at some anterior date. If nitrites are present at first, and after a few days disappear, this arises from continued oxidation into nitrates; if nitrates disappear, it seems probable this is caused by the action of bacteria or other low forms of life. Sometimes, in such a case, nitrites may be formed from the nitrates. Lime, in large quantity, indicates calcium carbonate, if boiling removes the lime; sulphate, or chloride, or nitrate, if boiling has little effect. Testing for calcium carbonate is important, in connection with purification with alum. Sulphuric acid, in large quantity,

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* Parkes's "Hygiene," vol. i, p. 79.

with little lime, indicates sodium sulphate, and usually much sodium chloride and carbonate are present, and in evaporation the water is alkaline. Large evidence of nitric acid, with little evidence of organic matter, indicates old contamination; if the organic matter be large, and especially if there be nitrous acid, as well as nitric, present, the impregnation is recent." Finally, the microscope will often give valuable assistance by examination of the sediment. De Chaumont divides waters into (1) pure water, (2) usable water, (3) suspicious water, and (4) impure water, with the following characters:—

| *Physical Characters.* | *Microscopical Characters.* |
|---|---|
| 1. Colorless, or bluish tint; transparent, sparkling, and well aërated; no sediment visible to the naked eye; no smell; taste palatable. | 1. Mineral matter; vegetable forms with endochrome; large animal forms; no organic *débris.* |
| 2. Colorless or slightly greenish tint; transparent, sparkling and well aërated; no suspended matter, or else easily separated by coarse filtration or subsidence; no smell; taste palatable. | 2. Same as No. 1. |
| 3. Yellow or strong green color; turbid; suspended matter considerable; no smell, but any marked taste. | 3. Vegetable and animal forms more or less pale and colorless; organic *débris*; fibres of clothing, or other evidences of house refuse. |
| 4. Color yellow or brown; turbid, and not easily purified by course filtration; large amount of suspended matter; any marked smell or taste. | 4. Bacteria of any kind; fungi; numerous vegetable and animal forms of low types; epithelia, or other animal structures; evidences of sewage; ova of parasites, etc. |

The "hardness" of water is due to the presence of earthy carbonates, or sulphates, or both. The former constitutes "removable hardness," because by boiling the carbon dioxide is driven off, and the base (calcium or magnesium oxide) is precipitated upon the bottom and sides of the vessel. The presence of earthy sulphates causes "permanent hardness," and the sum of the two, if present in any given specimen of water examined, constitutes the "total hardness." The degree of hardness is determined by the soap-test. The drinking of hard water is not necessarily injurious, although, to persons unaccustomed to its use, it may cause looseness of the bowels, or even dysenteric discharges. It has also been credited with causing stone in the bladder and goitre, perhaps without sufficient proof. Hard water is wasteful of soap, and in cooking vegetables does not soften the more solid portions; in making tea and coffee there is a loss of active principle, so that larger quantities are required of these materials.

**Physiological Effects.**—The effects of drinking natural waters may be divided into two groups: (1) those due simply to an increased supply of water to the organism; (2) those which may be ascribed directly to the mineral or other ingredients which may be present. Keeping in mind the bulk of fluid which is swallowed during a "course" of mineral waters, it is evident that the effects of the water itself must be taken into consideration.

Water is necessary both for the digestion and the assimilation of food. In excessive quantity, it dilutes the digestive fluids and interferes with absorption. In the conversion of sugar, if there is an insufficient amount of water, no fermentation will take place; if there is a large excess, instead of vinous, acetous fermentation will take place. Drinking habitually an excess of water at meals often aggravates dyspepsia, and may produce flatulence, and what Chomel termed "indigestion of fluids." The drinking of a glass of water, on first rising in the morning, clears the stomach of mucus and has a laxative effect Small quantities of warm water, half an hour before meals, increase appetite and digestion. A large quantity of fluid in the stomach favors vomiting, and, in cases where an emetic is given, swallowing a pint of warm water will greatly assist its action. The action of water in the intestines is similar to that in the stomach, and a too free indulgence in fluids often causes or keeps up a diarrhœa, as it increases the water, but not the solids, of the fæces. Water passes readily into the blood, especially after privation or hæmorrhage; in the latter case, the too rapid ingestion of water may have an injurious effect upon the red blood-corpuscles, causing their destruction by osmosis. The excess of water passes off by all channels of excretion, but it is principally noticed in the increase of the volume of urine. Not only is the water increased, but the excretion of urea, phosphoric and sulphuric acids, and sodium chloride is augmented, the latter only temporarily, but the former permanently. From this it has been inferred that water leads to augmented disintegration of tissues containing nitrogen and sulphur. But, as pointed out by Ringer, " simultaneously with the rapid disintegration a corresponding increase of assimilation takes place in the same tissues, whence it happens that water, taken under certain precautions, may increase both construction and destruction of tissue, and so act as a true tonic, improving the vigor of body and mind. . . The effects of water-drinking vary in different persons. The disintegration is greatest in weakly persons, on whom this process may produce almost a febrile state. Disintegration is greater in children than in adults, and greater, perhaps, in women than in men. A high temperature of the water, or of the external air, increases disintegration. Bodily exercise produces the same effect." (Parkes.)

It is a well-known fact that there are other restorative agencies at work at medical springs besides drinking the waters. The sanitary surroundings, fresh air, the tonic effects of change of air and scene, the physical and moral advantages of the regulated life, and systematized rest and exercise under medical direction all assist in producing the effects which fallow a visit to the "Springs." This is especially seen on the continent of Europe at Carlsbad, Vichy, Homburg, Ems, Kissingen, Baden-Baden, and numerous other German and French health resorts.

The mineral constituents of medicinal waters enable us to identify and classify them. They are usually divided into the chalybeate, or ferruginous; the acidulous, or carbonated; the alkaline; the saline; the sulphuretted, or hepatic waters; chemically indifferent, and unclassified waters.

The **chalybeate waters** contain a small quantity of iron, which is in solution when fresh, but after bottling tends to precipitate in the form of oxide. They sometimes contain, also, a minute quantity of arsenous acid. They are divided into two classes: first, those which contain carbon dioxide, and where the iron is in the form of a carbonate; and, secondly, those in which the iron is in the form of a sulphate. In **anæmia, chlorosis, struma, incipient phthisis,** and other conditions of **debility** they are highly useful, but should be avoided by the plethoric and by those who are subject to headache after taking iron.

The **acidulous waters** contain free carbon dioxide, and are sparkling and agreeable, but frequently contain in solution calcium, sodium and magnesium carbonates. In rheumatism, lithæmia, and dyspepsia the acidulous waters are useful, especially when taken at the springs. These waters vary greatly in the proportion of their solid constituents, and thus different waters of this class also possess properties which would place them in some other group, with which they might be classed with propriety.

**Alkaline waters** contain, besides carbon dioxide, an excess of sodium carbonate and other alkaline substances, and also chlorides and sulphates. An example of this class is Vichy water. In the purest alkaline waters there are scarcely any solid ingredients except the carbonates of the alkalies. They are frequently met with as thermal as well as cold springs.

Where there is a marked excess of sulphates and carbonates of the alkaline earths, which are held in solution by an excess of carbonic acid, the water is known as **calcareous,** or **earthy** water. Calcium sulphate is the particular salt present upon which the properties of these waters commonly depend, usually associated with calcium carbonate. Such waters are "hard." Calcium phosphate is also sometimes found in calcareous waters, and is a valuable constituent.

These waters are useful in the treatment of constipation, sluggishness of digestion, and deficiency of secretion, their purgative effects leading them to be universally used. Those containing magnesium and sodium sulphate are the best known, as Congress Spring, Saratoga; Cheltenham, and Friedrichshall. Wiesbaden and Baden-Baden contain chlorides; Homburg and Kissingen contain traces of iodine and of bromine; Carlsbad is an alkaline spring, and contains a small quantity of lithia; Vichy, Ems, Apollinaris, and Hunyadi Janos contain the alkaline carbonates.

**Saline waters** are solutions of halogen compounds of the alkalies, commonly distinguished by the presence of a large amount of sodium chloride. They also comprise solutions of calcium, potassium, lithium, and aluminum chlorides. Such water is "briny," and may contain traces of bromine or iodine in combination with the alkalies or alkaline earths.

**Sulphuretted** or **hepatic waters** are recognized by their odor of hydrogen sulphide, the gas being derived from the oxidation of iron pyrites in contact with water. The sulphides of sodium, calcium, magnesium, and potassium are sometimes present in these waters, singly or together, but always in very minute proportions. The hydrogen sulphide may vary from a mere trace to forty-two cubic centimetres in the litre. These waters are widely distributed, cold or thermal in various degrees. (A. N. Bell.)*

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* "Mineral Springs of the United States." *Journal of Balneology,* May, 1892.

In the United States there are large numbers of medicinal springs, and within the last fifty years there has accumulated a fund of information upon this subject, which only needs to be systematized and published in order to enable our own resources to be appreciated by American physicians. In many cases patients are sent to the older health resorts in Europe who could be as well treated here and saved the discomforts of ocean voyages. Much credit is due to Dr. A. N. Bell for disseminating valuable information in the journal of which he is the editor, *The Sanitarian*, and also for the valuable work, which he published some years ago in Wood's Library, on "Climatology and Mineral Waters of the United States."*

Dr. Bell classifies our native springs as follows:—

ALKALINE.

- Adams, California.
- Albury, Vermont.
- Alum, Virginia.
- Borax, California.
- Blount, Alabama.
- Berkshire, Vermont.
- Cañon City, Colorado.
- Carlisle, Colorado,
- Congress, California.
- Elgin, Vermont.
- Fry's Soda, California.
- Highland, California.
- Highgate, Vermont.
- Lower Soda, California.
- Milford, New Hampshire.
- Manitou, Colorado.
- Middletown, Vermont.
- Napa Soda, California.
- Newbury, Vermont.
- Perry, Illinois.
- Rocky Mountain, Colorado.
- Ravenden, Arkansas.
- South Park, Colorado.
- Summit Soda, California.
- Seltzer, California.
- Sheldon, Vermont.
- Vichy, California.
- Wilholt Soda, California.

CALCIC.

- Bethesda, Wisconsin.
- Butterworth, Michigan.
- Birch-Dale, Vermont.
- Clarendon, Vermont.
- Eaton Rapids, Michigan.
- Gettysburg, Pennsylvania.
- Hubbardstown, Michigan.
- Silurian, Wisconsin.

CHALYBEATE.

- Abbeville, South Carolina.
- Bedford, Pennsylvania.
- Blassburg, Pennsylvania.
- Cooper's Well, Mississippi.
- Estill, Kentucky.
- Fayette, Pennsylvania.
- Gordon's, Georgia.
- Greencastle, Indiana.
- Kittrell's, North Carolina.
- Madison, Georgia.
- Manley, North Carolina.
- Milford, New Hampshire.
- Montvale, Tennessee.
- Owosso, Michigan.
- Rowlands, Georgia.
- Schooley's Mountain, New Jersey.
- Schuyler County, Illinois.
- Sparta, Wisconsin.
- Versailles, Indiana.

PURGATIVE SALINE.

- Blue Lick, Kentucky.
- Crab Orchard, Kentucky.
- Elgin, Vermont.
- Esculapian, Kentucky.
- Harrodsburg, Kentucky.
- Midland, Michigan.
- Pagosa, Colorado.

SALINE.

- Fruit-Port Well, Michigan.
- Grand Haven, Michigan.
- Louisville Artesian, Kentucky.
- Michigan Congress, Michigan.
- Mt. Clemens, Michigan.
- Ocean, Alabama.
- Salt, Virginia.
- Spring-Lake Well, Michigan.
- St. Louis, Missouri.

SULPHUROUS.

- Alpena, Michigan.
- Balston, New York.
- Bladon, Florida.
- Blue Lick, Kentucky.
- Carlisle, Pennsylvania.
- De Soto, Louisiana.
- Dremion, Kentucky.
- French Lick, Indiana.
- Glenn's, South Carolina.

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* New York: Wm. Wood & Co., 1885.

Highgate, Vermont.
Indian, Georgia.
Indian, Indiana.
Lodi Artesian, Indiana.
Manley, North Carolina.
Minnequa, Pennsylvania.
Montesano, Missouri.
Olympian, Kentucky.
Portea Springs, Colorado.
Salt Sulphur, Virginia.
Saratoga, New York.
Sharon, New York.
Sheldon, Vermont.
Shocco, North Carolina.
St.HelenaWhite Sulphur,California.
St. Louis, Michigan.
Sweet, Missouri.
Valhemosa, Alabama.
West Baden, Indiana.
White Sulphur, Louisiana.
White Sulphur, Montana.
White Sulphur, Virginia.

Unclassified.

Alum, Virginia.
Birch-Dale, New Hampshire.
Borax, California.
Climax, Missouri.
Eureka, Arkansas.
Fairview, Texas.
Greeneleone, Florida.
Geysers, the American, Wyoming.
Geyser Spa, California.
Iodide and Bromide, Missouri.
Piedmont, Texas.
Stafford, Connecticut.
Summit, Maine.
Sheldon, Vermont.

Thermal Springs.

Aqua Caliente, New Mexico.
Arrow-Head, California.
Buncombe County, North Carolina.
Calistoga, California.
Chalk Creek Hot, Colorado.
Charleston Artesian,SouthCarolina.
Des Cehutes Hot, Oregon.
Harbines, California.
Hot Springs, Arkansas.
Idaho Hot, Colorado.
Merriweather, Georgia.
Middle Park Hot, Colorado.
Ojo Caliente, New Mexico.
Paraiso, California.
Passo Robles, California.
Salt Lake, Utah.
Seigler, California.
Skagg's, California.
Volcano, Nebraska.
Warm and Hot, West Virginia.

Some of the above-mentioned springs have won a high reputation, and the water is transported in large quantities to different parts of the country. From what has been said previously, it is evident that the water-cure is largely assisted by the sanitary surroundings. Some value, however, must be accorded to the water, and this may undoubtedly be obtained from bottled, genuine waters, although the tonic and stimulant effects of change of air and scene will be missing.

## CLIMATOTHERAPY AND CLIMATOLOGY.

Climatology, according to Dr. A. N. Bell, comprises "the sum of the influences exerted upon the atmosphere by temperature, humidity pressure, soil, proximity to the sea, lakes, rivers, plains, forests, mountains, light, ozone, electrical, and, doubtless, by some other conditions of which we have no knowledge" beyond observation of their effects. Climatotherapy studies the effects of climates and climatic conditions upon health. This brings us to the definition of climate by which we designate the characteristic and prevalent characters of a place as regards conditions of atmosphere, its temperature, moisture, purity or contamination, electrical tension and chemical constituents of the atmosphere. Climatic conditions are largely affected by the physical configuration of the earth's surface,—the presence or absence of mountains, forests, lakes, rivers, etc.,—and also by the latitude. In the summer months, the sun passes north of the equator, until, at the summer solstice, it, at its zenith, is in the zodiacal sign of Cancer; at the winter solstice the sun is at its zenith in the sign of Capricorn. Two imaginary lines, drawn the one north and the other south of the equator, and parallel with it at a distance of 23° 28′ in each hemisphere, would include the torrid zone, which includes the **north** and **south tropical zones.** Other circles, drawn at a distance of 66° 32′ from the equator, or 23° 28′ from the pole, in each hemisphere, mark the upper limits of the north and south **temperate zones.** The areas included between the polar circles and the poles are known as the **frigid zones.** Heat is a very important factor in climate. Maximum atmospheric temperatures are met with in the tropics, minimum in the frigid zones. The intermediate zones, which are the largest, present, also, the most favorable conditions for human existence and a great variety of climates, though, on the whole, temperate as compared with the polar or equatorial regions. Temperature is affected, also, by altitude. As we descend below the surface of the earth the temperature increases at the rate of 1° F. to every one hundred and twelve feet, and at less than two miles we have the temperature of boiling water, and at thirty miles it is estimated that, at the same ratio, " the heat is sufficiently intense to melt all the rocks and metals contained in the earth's crust and to account for the torrents of molten, fiery lava belched from the craters of raging volcanoes. It is to this internal heat of the earth that hot springs and the warm water of deep artesian wells are due." (Bell.) On the other hand, temperature declines as we ascend above sea-level at a rate of about 1 degree for every four hundred feet of altitude in the United States; so that high mountains stretch their tops into the regions of perpetual snow. At a certain elevation the moisture of the air congeals into snow, and this forms the " snow line," which, for obvious reasons, is higher at the equator; but it is not uniform, even on the same parallel, owing to local influences. The angle at which the sun's rays impinge upon the surface is the great cause of the diversity of temperature and the succession of climates from the equator to the poles, and irregularities of the surface give rise to various differences of climate in the same latitudes. The number of hours of daily sunshine in a given locality is a feature of great importance in climate. The direction of the prevailing winds, the amount of movement of the air, and the presence of moisture, also affect the salubrity of a locality and contribute to give it its therapeutic value. Aqueous vapor in the atmosphere constitutes a moist stratum which retards the process of nocturnal cooling of the whole atmosphere and prevents excessive alternations of temperature between night and day. The atmosphere always contains some moisture at a temperature above 32° F. The temperature of the sun's rays is greater than in the shade at any elevation and the difference, according to Dr. Chas. Denison, of Colorado, augments with elevation, there being " one degree greater difference between the temperature in the sun and shade for each rise of two hundred and thirty-five feet." This is owing to the fact above indicated, that the atmosphere is more easily traversed by heat when the amount of moisture is small. At an altitude of four thousand feet and upward the increase of heat in the sun's rays relative to the temperature of the surrounding air becomes a marked feature, insomuch that, at an altitude of from six thousand to ten thousand feet above the level of the sea, the thermometer exposed to the rays of the sun usually registers about one-third higher than when in the shade.

As regards valleys and hills, Dr. Bell makes the original observation that it does not follow, because the hills are higher than the valley, that they are necessarily colder and the valley warmer. The hills enjoy more sunlight and less moisture. The cold air, by reason of its greater density, descends into the valley and the warm air rises to the top of the hills, except where there is sufficient wind to produce disturbance and intermixture of the higher and lower strata of air, when this exception to the general rule will not occur. This affords a useful hint about selecting a habitation. "The damp and chilly valleys, with their attendant ills, are more frequently chosen as building places than drier, warmer, and healthier hills." Winds are always produced by differences of temperature and of atmospheric pressure due to expansion of air under the influence of heat. The direction in which winds blow depends upon the distribution of heat upon the earth's surface and the daily rotation of the earth. Winds always flow from a region of higher pressure to a lower one.

When air contains all the aqueous vapor which it can take up it is said to be at the point of **saturation,** which is also the dew-point, because above this point the moisture is deposited upon surrounding objects, in the form of dew. The higher the temperature of the air, the more moisture it is capable of taking up, in a geometrical ratio with the increase of temperature. The quantity of water in a given volume of air is called the **absolute humidity.** The ratio between the actual absolute humidity and the point of saturation is the degree of dampness, or **relative humidity.**

The atmosphere of the ocean and sea-shore is often supercharged with moisture from the spray, which it carries even for several miles inland. Winds from the sea are likely to have a high relative humidity. Winds from the poles are cold; those from the equator are warm, as the rule, in each hemisphere. When the temperature of air is rapidly reduced, the absolute humidity may approach the point of saturation, and the excess of water be precipitated as rain or snow. When a warm wind from the sea meets the cool air of a mountain-range, the excess of water is precipitated in the form of rain, and the air has its relative humidity reduced. The result is that a mountain-range parallel with a sea-coast will have a humid atmosphere upon one side and a comparatively dry one upon the other side.

The pressure of the atmosphere at the sea-level is fifteen pounds to the square inch of surface, which is equivalent to a weight of thirty inches of mercury, as demonstrated by Torricelli. The total pressure upon the surface of a man's body of ordinary size is nearly fifteen tons. This enormous pressure is not felt, for the reason that the human organism is adapted to it by nature. As the pressure diminishes, at the rate of about one pound for each two thousand feet, one of the factors in the therapeautic effects of high altitudes is probably the alteration of pressure upon the bodily surface and the resulting physical changes in the circulating fluid and the tissues. In mountain-climbing there is experienced a feeling of exhilaration and a lightness which may be due, in part, to the diminished density of the air. At an elevation of from ten thousand to sixteen thousand feet, rapid breathing, dyspnœa, and increased action of the heart occur, with feelings of faintness upon slight exertion; and, if the ascent has been rapid, as in a balloon, blood may pour from the nose and mouth and other mucous orifices of the body. A removal from the level of the sea to an altitude of two or three thousand feet, in the summer time, which is undertaken for sanitary and physiological reasons by large numbers of the population, is more than simply changing from a polluted atmosphere to a pure one, more than exchanging a humid atmosphere for a dry one, or a hot for a cool one; it is throwing off from the surface of the body a certain proportion of the atmospheric pressure and breathing a somewhat rarefied air, which of itself causes greater inspiratory effort and quickens the circulation.

As pointed out by von Petenkofer, Bowditch, and others, the nature of the soil and the drainage and rise and fall of the ground-water have much to do with the healthfulness of a climate. Bodies of water give forth moisture; bodies of sand and dry soil absorb it from the air. Sand being a poor conductor of heat, the sun's rays do not penetrate deeply, and the heat is radiated at night, making the night cold and the days hot, which feature characterizes the desert climate. An alluvial soil (clay or loam) being a better conductor, and usually being covered with vegetation, absorbs heat during the day and does not readily part with it at night, partly on account of the layer of moisture to which attention has already been directed. In consequence of this fact, a certain effect is exerted upon climate; the temperature does not get so hot during the day and is less cold at night. Forests protect the earth's surface from the action of the sun; the temperature of the woods is, therefore, cooler than the surrounding atmosphere, and, owing to the interference with evaporation, there is more moisture. Owing to the fact, in vegetable physiology, of the decomposition of carbon dioxide by the green parts of growing plants, in order to appropriate the carbon, there is a constant evolution of oxygen in the woods. The agitation of the air by the green leaves, especially in the coniferæ, causes some of the oxygen to appear as ozone, the effects of which upon the human body have already been referred to. This agent, which has been called "nature's antiseptic," is, therefore, likely to be met with in the woods, and also upon the sea-shore, but only exceptionally, and to a slight extent in large cities. The fact that a forest between a marsh and a city would protect the latter from paludal poison was known to the ancients. In resent times, the marshes around Rome have been redeemed and made habitable by the labors of the Trappists, who set out plantations of eucalyptus trees, which naturally absorb large amounts of moisture from the soil. Trees have a very decided effect, therefore, upon climate, not only by protecting the soil from the rays of the sun and favoring the healthfulness of a locality, but, as oxygen generators and ozone producers, as well as carbonic-acid destroyers, they play an important part in the preservation of animal life.

Water has an important function in climate. On account of its high specific heat, it abstracts heat from the surrounding air and cools it in summer, and in winter it yields up its store of heat slowly, by radiation, and thus modifies the rigors of climate at the sea-shore. The Gulf-stream makes northeastern Europe habitable, and the comparatively mild climate of our northwest coast is attributable to the warm current of the Japan stream, each of which flows like a great river in the ocean, mainly in a northeastern course. Marshes are caused by water spreading over a portion of ground, on account of the ground being level and porous. Such accummulations of water, with little or no current, and generally accompanied by decaying vegetation, have always been regarded as a fruitful source of ill health and malarial poisoning. As these manifestations usually appeared in the spring and fall of the year, they are sometimes known as vernal and autumnal fevers; or, from the pathological conditions, they are styled congestive chills, intermittent or remittent fevers, chills and fever.

With regard to the atmospheric electricity and its effects upon climate, very little is known of its relations to health and disease. It is probable that atmospheric ozone may be due to electrical conditions, and that the purity and stimulating qualities of the atmosphere in some localities is due, indirectly at least, to electricity. The frequency of thunder-showers in the mountains undoubtedly contributes to the sanitary qualities of these highly-prized health resorts.

As to the physiological effects of climate upon human beings, very important facts have been established by investigations in the fields of anthropology, ethnology, and vertebrate paleontology. Man is affected by his environment, and the most important factors in the problem are food and climate. Reserving the former for discussion in the section on "Dietetics," we may here devote a few words to a few fundamental facts in physiology and in pathology. At the same time, it must be stated that they are in social relations very closely connected; because a climate that is unfavorable for human life is also unfavorable for the life of domestic and other animals upon which man depends for subsistence, and is also unfavorable to agriculture, so that insufficient food and a severe climate act in concert to produce physical degradation. A very hot climate, on the other hand, while it favors vegetation, also favors the development of malaria and other miasmatic poisons, like yellow fever, which not only cause disease, but cause physical degeneration in races which do not become acclimated. The dark-skinned races of men are able to live in the tropics with apparent impunity, but the white races do not find the climate propitious, either with reference to individual health or the rearing of children. In a similar manner, certain families or tribes of men, having for many generations lived in one locality and accustomed to the climate (harmonized with the environment), may find great difficulty in becoming acclimated, should they remove into another region having a different character.

While it is difficult to define climate, and while the subject is a complex and difficult one, yet it is one of those scientific terms which have become parts of common speech, and are generally understood in their popular acceptation. Agreeing with the definition of Hann and Humboldt, we may accept climate as comprising the whole of the meteorological phenomena characterizing the state of the atmosphere at any place, particularly as they affect our organs, or have an influence on animal or vegetable life. The general character must be taken, not basing the conclusion upon the limited observation of a few days, or even years; but a period must be taken which is long enough to furnish the data for composing a type. Equal yearly averages do not signify identical climate. A place where the summer heat and winter cold are extreme has not the same climate as one where the range is relatively small, though the yearly average may be identical. Hence we need, says a recent writer,* separate determinations of summer and of winter averages. The combinations of conditions of temperature and moisture may be endless, whilst the averages of either may be hardly disturbed. These facts make it hard to compare climates, even when they are steady for long periods. In the capricious climates of our temperate latitudes, a just determination and comparison form a baffling task.

Local influences may change so as to bring about a modification of climate. This has been noticed after cutting down groves of trees, and especially after draining alluvial soil. A very good illustration is given by Dr. W. J. Hutchinson of the effects upon the climate of Southern California produced by the appearance of Salton Lake. It is claimed that this new-formed body of water has increased the humidity of the atmosphere and the rainfall over a considerable area. The result has been a reduction of the high temperature which prevails in other parts of Southern California.

The effects of climate upon physical conformation is an inviting field of study. The Serranas, a native tribe of Peru, live in the high peaks of the Andes and are short in stature, but have a remarkably well-developed thorax and lungs, being about thirty-six inches around the chest, with a bodily height of seven and four-fifths inches less than the average height of Europeans.† The Esquimaux are a short, thickset race, who apparently are so worsted in their struggle with adverse climatic conditions as to extinguish nearly every manifestation of intelligence except as regards the supply of physical wants and the protection from the weather. On the contrary, the hot weather of the tropics is enervating on account, largely, of its excessive humidity, and debility and anæmia are common results. In temperate zones, however, man attains his highest physical, intellectual, and moral elevation, and these regions furnish explorers, armies and navies, and the pioneers of commerce and civilization who discover and rule less favored races, and penetrate to the ends of the earth and make them tributary to science and the social requirements of the age in which we live. The more cultured races having acquired a knowledge of sanitation, and especially of the causes of infection, are able to apply this knowledge for the protection of health. The excessive mortality which formerly prevailed among the English troops in India and the West Indies was attributed by the late Dr. Parkes to the tolerance of unsanitary conditions rather than to the climate itself. Under improved methods of sanitation, especially as regards the purity of the water-supply and cleanliness of habitations, the mortality has been steadily decreasing "until, in some stations in the West Indies

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* Dr. W. H. Larrabee, *Popular Science Monthly.*

† Quoted by Dr. A. N. Bell from the Official Report of Medical Inspector B. F. Gibbes, U. S. N., on the Medical Topography of the Pacific Coast of South America.

(as, for example, Trinidad and Barbadoes), the sickness and mortality among European soldiers are actually less than in home service. In India, a century ago, people spoke with horror of the terrible climate of Bombay and Calcutta; and yet, Europeans now live in health and comfort in both cities. In Algeria the French experience is to the same effect." Parkes also directs attention to the greater necessity of sanitary precautions in hot climates. "The temperature and the humidity of the air are highly favorable to decomposition of all kinds; the effluvia from an impure soil and the putrescent changes going on in it are greatly aggravated by heat. The effects of unsanitary evils—which, in a cold climate like Canada, are partly neutralized by the cold—are developed in the West Indies or in tropical India to the greatest degree. In this way a tropical climate is evidently most powerful, and it renders all sanitary precautions tenfold more necessary than in a temperate zone." Dr. Bell coincides with these views, and even in the case of pulmonary consumption, the prevalence of which in certain localities is usually held to afford a rough indication of the influence of climate, he regards it as "a disease which, probably more than any other, depends upon preventable conditions intimately associated with a foul soil or density of population."

The good effects of the most salubrious climates may be overcome and disease develop as the result of neglect of common sanitary duties and violation of physiological laws. The intelligent physician is able to point out the causes of ill health and enable the patient to avoid them. The philosophy of the modern exodus from the large cities to the country, sea-side, and mountains which takes place in the hot months of the year, may be easily understood from what has just been explained. It is the same in the climatic treatment of disease. If pulmonary tuberculosis be due to overcrowding and a polluted atmosphere, the remedy is obvious—the patient should be taken to a place which is not crowded and where the air is pure, and he will be placed under the best conditions for his recovery.

**Climatotherapy.**—No satisfactory classification of climates can be made, and the distinctions made are often conventional and relative. Hot and cold climates, humid and dry climates, marine and inland climates convey certain general ideas to the mind. The climate of elevated plateaus and mountains and the climate of valleys and plains differ to a marked degree, owing to conditions which have been already considered.

The United States, in its wide area, offers a choice of every variety of climate. An ocean climate may be enjoyed at the sea-shore or on islands some distance from the coast. The mountain-ranges of the Appalachian system or of the Rocky Mountains contain numerous health resorts of well-earned reputation. The high table-lands of New Mexico and Arizona are remarkable for their salubrity, while the valleys of California between the Foot Hills and the coast-range of mountains afford spots of remarkable fertility; beauty, and health-giving powers. We have the cold climates of Maine and Minnesota, or the hot ones of the Eastern Atlantic Coast in the Southern States; and in Florida we have a new-world Riviéra upon the Gulf coast, especially around Tarpon Springs.

Change of climate is frequently beneficial in disease, owing to mental and moral conditions, or the psychological effects; on the other hand, it is an act of cruelty to deprive some semi-helpless invalids of the comforts that they are accustomed to enjoy and make them suffer the pangs of home-sickness, in addition to their physical weakness and disease. Moreover, in speaking, in a general way, of climate in the treatment of disease, it must be remembered that each locality possesses individual peculiarities, such as dryness or dampness of the soil, excess of sun or shade, direction of prevailing winds, the presence of forest-trees or bodies of water, as well as convenience of access and other circumstances not climatic (such as comfortable hotel accommodations, good milk and other food in abundance), which contribute very much toward the availability of any particular resort in any special case. It is of importance, therefore, that physicians should acquaint themselves fully regarding the advantages and disadvantages of health resorts that they recommend for their patients, and it is better to do this by personal inspection, wherever possible. Attention has already been called to the fact that the most salubrious localities may lose all their advantages by neglect of sanitary precautions; for we know that cases of typhoid fever and dysentery, and other forms of ill health, may arise from foul drains or an infected water-supply, even among the best surroundings. A good classification is that of Dr. Hermann Weber,* which, with some modifications, is as follows:—

### A. MARINE CLIMATES.

#### I. *Marine Climates with High Degree of Humidity.*

(1) Warm and Moist Marine Climates:—
*Illustrations:* Madeira, Canary Islands, The Azores, Ceylon, Sandwich Islands, Bahamas, Bermudas, Virgin Islands, Cuba, Jamaica, Barbadoes, Florida, Georgia, South Carolina, Society Islands, Tahiti, Tonga, Fiji Islands, Tristan d'Acunha, St. Helena.

(2) Cool and Moist Marine Climates:—
Island of Bute, Rothesay, Hebrides, Orkney and Shetland Islands, Faroë Islands, Iceland, Bergen, Marstrand, Auckland Islands, Falkland Islands.

#### II. *Marine Climates with Medium Degree of Humidity.*

(1) Warm Marine Climates of Medium Humidity:—
Tangiers, Algiers, Cadiz, San Lucar, Gibraltar, Ajaccio, The Sanguinaires, Palermo, Riviera di Levante, Pegli, Venice, Balkan Peninsula, Corfu, Crimea, Lisbon, Vigo, Santander, Biarritz, New Zealand, Auckland, New Plymouth, Wellington, Nelson, Virginia Beach, Old Point Comfort.

(2) Cool Marine Climates of Medium Humidity:—
Coasts of England and Ireland, Newport, Isle of Shoals, Nantucket, Mount Desert, Fire Island.

(*a*) Winter Resorts:—
Queenstown, Isle of Wight, Florida, Lakewood, N. J.

(*b*) Summer Resorts:—
North Coast of Cornwall and Devonshire, Wales, Ireland, Brest, North Coast of France, Belgium, Holland, Germany, Tasmania.

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* Von Ziemssen's "Hand-book of General Therapeutics," vol. iv. English translation. New York: William Wood & Co., 1895. In connection with this subject, and for information of which want of space prevents proper discussion in this place, the reader is referred to the valuable treatise of Dr. A. N. Bell, of New York, on Climatology and Mineral Springs of the United States, and also to the more recent work of Dr. Bushrod W. James, entitled "American Resorts, with Notes upon their Climate." Philadelphia: The F. A. Davis Co., 1889.

III. *Marine Climates with Low Degree of Humidity.*

The Western Riviéra, Nice, Monte Carlo, Mentone, Naples, Capri, Ischia, Malta, The Balearic Islands, Smyrna, Athens, South Africa, Australia, New South Wales, Sydney, Victoria, Melbourne, The New Jersey Coast, Long Branch, Atlantic City, Cape May.

### B. INLAND CLIMATES.

(1) Climates of High Altitudes, or Mountain Climates:—
Davos-Platz, Davos-Dörfli, Davos-Frauenkirch Wiesen, St. Moritz, European Alpine Resorts, German Mountain Resorts, Northern Italy, Apennines and Maritime Alps, Peruvian Andes, Rocky Mountains, Colorado Springs, Denver, St. Paul, Asheville, South Africa, India, Mexico, Catskills, Alleghenies, Cresson, Green Mountains, White Mountains, Glen Summit, Pocono, Kane, Schooley's Mountain, etc.

(2) Climates of Low Levels:—
Dry and Warm Climates: Africa, New Mexico, California.
Dry and Cold Climates: Minnesota, Canada.
Moderately Moist Climates: Rome, Pisa, Pau, New England States, Saratoga, etc.

## CHOICE OF CLIMATE FOR THE TREATMENT OR PREVENTION OF DISEASE.

In determining the correct solution of the question as to the climatic treatment in any given disease, the physician has to solve a complex problem, into which enter the psychical condition of the patient; his financial ability, his capacity to endure the discomforts of travel, and his personal preferences and habits of life, as well as the nature of his disease and the advantages and physiological effects of the proposed place of residence. Patients with seriously damaged lungs, kidneys, or hearts should not be sent to high altitudes; or, if they insist upon making the experiment, they must be allowed to make the change gradually, by resting for several weeks or months at intermediate points. Patients whose vitality is exhausted, and who are evidently doomed to early dissolution, should not be allowed to go to distant health resorts, deprived of the comforts of home, and only to die among strangers. A very sick patient does not enjoy scenery or the incidents of travel, and often actually suffers more from home-sickness than from his disease. Phthisical cases in the second or third stage should, as the rule, be kept from a moist climate, whether cool or warm, as the progress of the disease is generally hastened.

Summer residence in the country is a prudent, sanitary, and prophylactic measure, by rare coincidence having for its support both fashion and medical teaching. Its effects are most demonstrably evident in the younger members of the family. In some instances, where health is impaired or notably affected by residence in the city, a permanent change of place of living should be advised, if practicable. Pure air, pure water, wholesome food, and a regulated life are the conditions of health and longevity, and, therefore, are factors in the therapeutic problem. A patient cannot live on climate alone, although, in popular discussions of the subject, this is dwelt upon as if it were the only thing to be considered. With this in mind, we will proceed to outline the climatic treatment of some principal diseases:—

**Acute diseases,** as the rule, should be treated at home, or in the immediate vicinity.

**Anæmia and Chlorosis.**—Such cases are benefited by life in the open air, where there is abundance of sunshine and the temperature does not forbid physical exercise. The sea-coast, early in the summer, followed by a stay at the mountains later, is advisable, together with outdoor amusements and bicycle or horse-back exercise. If much debilitated, a preliminary visit to a good hydropathic institution would be of great value in building up the nervous system and increasing hæmatosis. Weber recommends places where the whole day may be spent in the open air without demands being made on the bodily strength. Long sea-voyages are often curative.

**Asthma.**—Where there is no heart complication and no emphysema, these patients do well at mountain stations, or on inland plateaus. Where there is much bronchial complication, a dry climate should be preferred; where the secretion is scanty, the patient may improve more rapidly among the pine-woods, near the coast. We cannot predict, in any given case of asthma, whether it will be benefited by a marine climate or not; but, as a general rule, especially if there is emphysema present, these cases do better at a moderate elevation inland. Mountain-climbing is useful as a form of respiratory gymnastics, especially in catarrhal complications.

Children and nervous subjects are usually benefited by the sea-shore. Hay-fever patients seek a pure atmosphere, free from dust and pollen. They may find relief either in mountain resorts (Bethlehem, White Mountains, Kane, etc.) or on islands (such as Nantucket).

**Bronchial Catarrh.**—Chronic bronchial catarrh, with merely increase of secretion and a moderate amount' of cough, may be benefited by either a marine atmosphere or by mountain or inland climate. The change of residence of itself is of service, even where there is not much difference in climate, altitude, or temperature. In the declining stage of whooping-cough, systematic exercise in the open air is an important part of the treatment; and, as a general rule, in chronic cough, unattended by much pathological change, the best results are obtained from pedestrianism, especially in mountain regions, such as the Catskills.

**Blood Disorders.**—In morbid conditions of the blood the climatic treatment is a useful adjunct to the ordinary treatment by alteratives, tonics, and chalybeates. Careful regulation of the diet and hygienic management are also required in all cases. Residence at the sea-shore exercises a powerful alterative effect, and, owing to the presence of ozone, it is a decided stimulant to tissue construction. As anæmia and chlorosis may result from a warm, humid climate, a change to a moderately cool, bracing atmosphere is attended by improvement. A moderate amount of cold, even, will do no harm if the clothing and living-rooms be properly adopted to the temperature; the cold will improve the appetite and favor out-door exercise. In cases attended by profuse menstruation sea-climates are often injurious, and in early pregnancy abortion may occur at the sea-shore.

**Climacteric disturbances of health** are greatly influenced by climatic conditions. Not only at the change of life in women, at the cessation of menstruation,—but also at puberty do we meet with evidences of disorder, particularly of the nervous system, but the circulation and organs of digestion and assimiliation are also affected. There may be delayed development or insufficient evolution of the sexual system and deterioration of the general health. In such cases change of climate, the excitement of change of scene, and pleasure of voyaging are useful adjuncts to the means employed to bring about the normal state. **Premature senility,** either of organs or of the general system, is sometimes mistaken for ordinary disease, and uselessly treated by medicines. Lowering of general activity, easily-produced fatigue, liability to catarrhal attacks, with impaired digestion, are the prominent symptoms of this condition. By a resort to warm, sunny, and dry climates during the winter season and a moderately elevated mountain climate in the summer many of these complaints are overcome or avoided, and in this way life may be prolonged and senile decay deferred.

**Consumption.**—The climatic treatment of pulmonary phthisis, or consumption, has been the subject of study from the earliest times, and an abundant literature has accumulated upon it, including such valuable recent works as that of J. A. Lindsay or C. T. Williams. It has also received favorable consideration in the writings of Jaccoud, Austin Flint, Charles Denison, Trudeau, and other authorities. No climate can be regarded as possessing a specific effect in arresting phthisis, although some exert a much more favorable influence than others in bringing this about. According to Flint, " Dryness, equability, and purity of the atmosphere are essential elements of a favorable climate," and he further declares that " there is reason to believe that the benefit derived from climatic treatment is often, in a great measure, due to accessory circumstances."*

In his address read recently before the Berlin International Medical Congress, Dr. Weber considered the influence of climatic, local and social conditions on the occurrence and course of pulmonary tuberculosis. As already stated, no climate is entirely exempt from phthisis. He agrees with Hirsch that, if we consider the distribution of phthisis over the world, we must come to the conclusion that the climatic conditions alone, apart from other conditions, especially the social ones, will not afford a sufficient explanation of that distribution. It is necessary to consider the temperature, condition of the soil (dryness or dampness), the elevation above the sea-level, race, effect of colonization, social circumstances, and the industrial pursuits. Phthisis progresses more rapidly in the tropics than in the temperate zones, and he considers that the bacilli are favored by their development by heat and moisture, and also that their products are more toxic under such conditions.

Hygienic regulations are more apt to be obeyed at a health resort than at home. There is also a freedom from the cares of business or the household, combined with association with new acquaintances, affording diversion and mental relaxation, which act as nerve-tonics. Very often patients can eat more food when away from home than when at their own table. All these accessory agencies are of value, and contribute to the undoubtedly beneficial effects of change of scene. Cold and damp locations are to be avoided, especially if the patient is thereby compelled to remain in his room. The great object is to select a climate favorable to living in the open air the greater part of the time. In New Mexico it is possible to remain day and night in the air, on account of the dryness of the atmosphere. Distance and convenience of access must be taken into consideration, so that, if the patient becomes home-sick or desires to be taken home, it will not be impossible to bring him back without unduly taxing his strength. If the patient be very feeble, it will not be advisable to disturb him with a journey, unless it be merely to the suburbs of the city during hot weather. On the other hand, if the case be in its incipiency and the patient young and his health not much impaired, it may be better for him to emigrate, and remain permanently in some climate that will agree with him. Dr. Flint suggested that, if the patient bear hot weather well and is worse in cold weather, he should go South, at least during the winter; on the contrary, if he is always better in cold weather, he would do wisely in going to a northern resort, such as Denver, Colorado Springs, St. Paul, etc. Some cases have done very well at Newport, but during the summer a stay in the woods is to be preferred to the sea-shore, for reasons already indicated. The Adirondacks have attained a world-wide reputation for the cure of pulmonary diseases, and the pines of Lakewood, New Jersey, and Asheville, North Carolina, are also famous health stations for the cure of consumption.

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* Pepper's "System of Medicine," vol. iii, p. 429.

**Exhaustion from Overwork and So-Called Neurasthenia.**—These are conditions in a sense allied to hypochondriasis and hysteria, and, with these, are benefited by combined balneo-therapeutic and climatic methods of treatment.

**Indigestion and Dyspepsia** are closely related to the foregoing, being largely functional, and are greatly benefited by change of climate. The same remark holds good for chronic diarrhœa, which can often only be permanently arrested by a sojourn in a dry and equable climate.

**Insomnia** is relieved by change of residence, either to the mountains or the sea-shore. In nervous erethism, where patients are easily excited, it is of importance to learn the character of the hotel to which they are sent, inasmuch as their comfort and health depend principally upon freedom from noise and excitement. If music and dancing until after midnight is the rule of the house, their sleep may be more broken than at home. A suitable environment is of as much importance as a proper climate.

**Lesions of the Nervous System.**—According to Weber, nervous disorders should more often be subjected to treatment by climate than is customary.

**Leukæmia** is apparently benefited by long cruises in yachts, and Weber advises, in addition, prolonged stay in Egypt or Algiers. In advanced cases little can be expected beyond extending the duration of life. In **malarial toxæmia** mountain regions are curative; damp situations are to be avoided on land, but sea-voyages are useful.

## DIET IN DISEASE.

The principles of dietetics, and likewise the physiology of nutrition, apply equally in disease and in health, the only difference being that the power of digestion and assimilation with the secreting and excreting functions are more or less impaired; the food must, therefore, be of a character suitable for assimilation, of nourishing quality, and administered in quantities, and at such intervals, as appear best suited for the case. The aid which properly selected food can render in the treatment of disease is now generally acknowledged. If, as Abernethy is reported as saying, it be a fact that the cause and cure of most diseases is at the table, the importance in therapeutics of food is no less than drugs. Oliver Wendell Holmes, nearly thirty years ago, in his essay on the "Border Lines of Knowledge in Some Provinces of Medical Science," declared his high appreciation of this subject as follows: "I cannot help believing that medical curative treatment will, by and by, resolve itself in great measure into modifications of the food swallowed and breathed, and of the natural stimuli, and that less will be expected from specific and noxious disturbing agents, either alien or assimilable." Dr. Austin Flint, in his posthumous address on the "Medicine of the Future," prepared for the meeting of the British Medical Association in 1886, expressed a similar idea. "It is a pleasant thought that hereafter the practice of medicine may not be so closely interwoven as hitherto in the popular mind with the use of drugs. The time may come when the visits of the physician will not, as a matter of course, involve the co-operation of the pharmacist; when medical prescriptions will be divested of all mystery, and have no force in the way of fortifying the confidence of the patient. The medical profession will have reached an ideal position when the physician, guided by his knowledge of diagnosis, the natural history of diseases, and existing therapeutic resources, may, with neither self-distrust nor the distrust of others, treat an acute disease by hygienic measures without potent medication. When this time comes a system of practice which assumes to substitute medicinal dynamics for the *vis medicatrix naturæ* will have been added to the list of by-gone medical delusions."*

The influences of climate, custom, and nationality upon diet and the reciprocal relations of diet upon customs and ethnic traits are of the highest importance in the study of demography. Dr. Gihon (*loc. cit.*) says that "the food of a people largely determines its national characteristics, but climate determines the food." He supplies the following apposite illustration: "The Chinese of the northern provinces live on millet and wheat and vegetables, because these thrive best in the dry and dusty soil and severe winter; while the moist, hot climate of Southern China produces rice, which, with fish, is the staple aliment of many millions of people. The lack of variety harmonizes with the conservatism of the race, and has contributed to that spirit of contentment and domesticity which, as in Japan, are elements of rare happiness not enjoyed by nations boasting a higher civilization." The relation of this to the subject under consideration is twofold. First, in selecting a dietary for a sick person, it is important to learn what kind of food his stomach is accustomed to, as, other things being equal, it will also be the kind that he can most readily assimilate. Secondly, many diseases are traceable to the food being insufficient in quantity, or deficient in quality, or improperly combined. Thus, insufficient nourishment produces anæmia (anhæmatosis), emaciation, debility, (neurasthenia), myalgia, neuralgia, and probably rachitis, scrofula, and is an active predisposing cause for phthisis. Food of inferior quality causes such widespread disorders as pellagra, beriberi, or kakki, and ergotism. Improperly assorted food causes Bright's disease of the kidneys, scorbutus, many of the disorders of infancy, gout, rheumatism, and possibly cancer (?). Other disorders due to infected food, such as trichiniasis, hydatid disease, intestinal parasites, and infectious disorders, cholera, typhoid fever, dysentery, etc., need only be mentioned here in order to put us on our guard, so that the dietary for the sick may be quite innocent and free from such disturbing elements. Dr. Gihon insists upon the relationship between food and climate, and points out the fact that the climate of India and Equatorial Africa is deadly to those Europeans who keep up the style of eating and drinking that they follow at home; whereas, others who suit their dietary to the climate, find themselves not injured by it.

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* This and the preceding quotation from Holmes are taken from the admirable address of Medical Director A. L. Gihon, U. S. N., President of the Section on Medical Climatology and Demography. Transactions of the Ninth International Medical Congress, held at Washington, 1887, vol. v.

While physicians are rarely consulted with regard to the selection of food in health, men being guided by the cravings of their appetite and the force of custom in eating, yet a recognition of the existence of this factor in any case of disease will naturally lead to such regulation of the diet as is most favorable for restoring and maintaining health. This truth was properly appreciated by the ancients, who made some applications of it, guided by experience alone. It is a fact, as stated by Prof. J. Bauer, that "the scientific basis of a system of rational dietetics could not be laid until the first principles at least of the processes of digestion and metabolism in the human body, under normal and under pathological conditions, were known." Acquaintance with the chemical composition of foods and proximate principles and knowledge of the part played by each in the organism were necessary before we could properly solve the relation of the dietetics to diseased conditions and make the proper selection of viands for the sick. Two difficulties are met at the start,—the kind of food that science would indicate, as the most appropriate might be repugnant to the patient, who would refuse to take it, or, having taken it, such food might not be capable of being digested and assimilated as well as other articles which are less desirable, but more digestible; secondly, the condition of the digestive organs is such that their ability to eat ordinarily articles of food is suspended. In many diseased conditions the waste of the tissues is increased, while the power of the organism to assimilate food is diminished; so that it is difficult, if not impossible, to introduce nourishment in sufficient quantity to make up for the loss. This is especially manifest in acute febrile processes, which are usually accompanied by more or less involvement of the organs of digestion. If the power of digestion is suspended for the time, it is necessary to withhold food, until it is, in part at least, restored; otherwise the food would remain undigested in the alimentary canal, and, becoming the subject of fermentative or putrefactive change, it would give rise to additional irritation. Where it is not entirely abolished, we may aid in keeping up the patient's strength by small quantities of bland, easily-digested foods until he is in a position to take more substantial foods. If emaciation is progressing and the patient losing strength, the administration of highly nourishing foods is imperative; if they cannot be retained or digested by the stomach, they may be administered by enema or by hypodermic injection. In extreme emergencies we may even inject milk into the blood, or hypodermically, or blood may be injected into the peritoneal cavity. Baths of milk have been proposed, but, as stated in a previous section, they have no nutritive value. Fatty nutritious substances, like lard, olive-oil, butter, codliver-oil, etc., may be introduced by inunction with great benefit, combined with friction or massage to assist in their absorption.

On the other hand, in plethoric, well-nourished individuals, where the process of denutrition is not going on very rapidly, entire abstinence from food for a brief period will do no harm. After surgical operations it is sometimes advisable to allow the patient to go without food for several hours before the operation is performed, and for several days afterward, allowing nothing but water in teaspoonful doses.

The so-called hunger-cures, in which fasting is followed as a therapeutic measure, are not popular at the present day; but they have, undoubtedly, much to commend them in cases of plethora and so-called subacute rheumatism. In cases of acute pneumonia, food should be of the lightest character, as the rule, and in most acute diseases, where the patient is not asthenic, the diet should consist principally of what are called accessory foods and light broths until convalescence is established, when a more varied *menu* may be permitted. It is evident that many circumstances require to be considered and duly estimated in laying down a dietary for a patient. The extremes of life bear abstinence poorly, as the rule, and success in treatment will often depend upon the maintenance of supplies of food; on the contrary, well-nourished adults may live for a considerable time with the minimum of nourishment. Less food is needed, as the rule, in summer than in winter. At the present day there is a tendency to overfeeding, both among the sick and the well; and where disorders are due to excess of certain forms of nourishment, as particularly insisted upon by T. Lauder Brunton and Milner Fothergill, diminution of food and careful regulation of diet is of more consequence than drugs.

Some of the phases of the question of alimentation have been more fully considered by the author elsewhere* than is possible here. It will be only possible to present here a brief outline of the paper referred to. The fluids and solids which enter into the composition of the human body are constantly the subject of change under the influence of cell-life, and after serving their purpose are excreted from the body. This necessitates renewal by process of nutrition, and such substances are introduced mainly by the food and drink. Chemically, the proximate principles of the food are inorganic (or mineral) and organic, the latter being divided into those not containing nitrogen and those containing nitrogen. Non-nitrogenous substances are again subdivided into hydrocarbons and carbohydrates. Carbohydrates (starch and sugar) contain hydrogen and oxygen in the proportion to form water. Hydrocarbons (oils and fats) are compounds of hydrogen and carbon, combined with a small proportion of oxygen. In addition to these three principal varieties of organic substances, we consume organic acids, present in vegetables and fruits, and pectin, which occupy an humbler position in regard to nutrition, but which assist in maintaining animal heat. Nitrogenized organic substances find their type in albumen, and, on account of their importance, they are often called "proteids." Albuminoids are characterized by the presence of carbon, hydrogen, oxygen, and nitrogen, with other elements variously combined. They occur both in the animal and vegetable kingdoms. The problem of digestion is, to render albumen, sugar, starches, fat, and other food-ingredients, soluble in the gastric and intestinal fluids. Albumen is rendered soluble by being converted into peptones through the activity of the gastric juice, and, in the small intestine, by the alkaline pancreatic fluid. Starch becomes maltose and glucose; this is partly accomplished by the saliva and partly by the pancreatic and intestinal juices. The bile favors the absorption of fat by emulsifying it, and, by its action upon the villi and its antiseptic qualities, preventing the fat from being converted into fatty acids. The pancreatic secretion also acts upon the fatty articles, emulsifying them and favoring their absorption. The portal blood and liver transform peptones into serum-albumen, and change the glucose derived from starch back again into an insoluble form called glycogen, in which shape it is stored up in the cells of the liver, to be given out in small quantities, as it is needed to supply energy to the tissues. Fat is absorbed and gradually assimilated by the lacteal vessels and general circulation.

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* "Food and Diet in Health and Disease." *Medical Bulletin*, January, 1892.

This review of the physiology of food is a necessary introduction to the consideration of its proper administration in health and disease. As the present discussion is limited to the latter, we will omit discussion as to the relative quantity of each form of food, only stipulating that each shall be represented in a full dietary. In this country there is, without doubt, too great consumption of nitrogenized food, which leads to diseases of the kidneys and liver, with many obscure symptoms that find their place under the heading of lithæmia or uræmia. These are often removed by restricting nitrogenous food or removing entirely meat from the diet.

Habits of eating affect the results. Some forms of indigestion or dyspepsia are clearly traceable to insufficient mastication of the food. The therapeutic teaching here is not to change the diet, but to tell the patient to eat more deliberately and chew his food thoroughly. Good food may be spoiled by poor cooking, and the digestibility of food is very much affected by the manner of preparation. The frying pan is such a frequent cause of indigestion that it has been almost banished from well-managed households.

Different aliments vary as to their digestibility. This depends upon their nature, mode of preparation, age, time of year, mode of life, among animals, and affects their value as foods. The flesh of young animals, though soft and tender, is too albuminous and is less digestible than the older members of the same species,—veal and lamb being less digestible than beef or mutton. If, on the other hand, the animal is too old, its flesh is apt to be tough, unpalatable, and indigestible, but makes better broth than the very young animal. Eggs and milk are much used in the sick-room, on account of their nutritious qualities and ease of assimilation. Among starchy foods bread is at the head of the list; it is, when well made, very acceptable and usually readily digested. If a little stale, or slightly toasted, it becomes more acceptable to invalids or convalescents. Rice is also a useful carbohydrate, and with it may be named farina, tapioca, sago, corn-starch, from which many articles of food for the sick are made. Peas and beans are less digestible on account of their thick, testaceous envelope and the presence of albumen in the form of vegetable casein or legumen. Potatoes, when baked, are very acceptable to convalescents, but other vegetables are liable to cause indigestion, from the amount of cellulose which they contain. Fruits are likewise beneficial to the system. Poor in albumen, rich in water, they are chiefly of value on account of the vegetable acids, salts and carbohydrates which they contain. They diminish the acidity of the urine, many of them produce a laxative effect, and they counteract an injurious influence of the undue restriction of the diet to dried and salted meats. Apples open the bowels and will often allay nausea. Certain fruits, on the contrary, possess astringent properties, and are useful in relaxed conditions of the bowels. Tea, coffee and cocoa are valuable arterial stimulants, and, with milk and sugar, are nutritive. Chocolate contains about 20 per cent. of albumen and 50 per cent. of fat, with an alkaloid (theobromine) allied to caffeine. Its large proportion of fat will often render it unsuitable for weak stomachs. The question of the administration of alcohol is considered in another place (see Part II). Lighter wines or malt liquors have some nutritive value, and when used in moderation, are useful, especially among elderly people.

As regards the interval between the administration of articles of food, this should be prescribed as carefully as in taking medicine. Where the amount given at a time is small, the interval must be correspondingly short, having in mind the total amount of nourishment to be taken in the twenty-four hours. The night is long for a sick person and directions for the administration of some light nourishment should be given. Sometimes insomnia is relieved by taking food at night. In dyspepsia and chronic indigestion, the question of diet is difficult to solve. Many of these cases have gastric catarrh, which requires to be relieved before digestion can be improved. The microbes of fermentation and putrefaction, which cause flatulence, pyrosis, and various nervous disorders,* are present, and interfere with the normal digestion of foods. It sometimes is advisable to place such patients upon a restricted milk diet, giving a tablespoonful of sterilized milk every hour or hour and a half, increasing it, day by day, until six ounces or more are taken every ninety minutes, at which it may be continued for a specified time,—a month or six weeks,—when articles of food, properly selected, may be added cautiously to the dietary. Where there is marked hepatic disorder, accompanied by oxalic-acid or uric-acid deposits in the urine, headache, pains about the body, and lowness of spirits, it will be advisable to limit the albuminous food or forbid meat altogether for a time. In very severe cases of indigestion, especially in young infants, it will be advisable to administer only predigested food for a time.

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* T. Lauder Brunton: "On Poisons Formed from Food and their Relation to Biliousness and Diarrhœa." *The Practitioner*, August, September, and October, 1885 Also, "On Disorders of Digestion, their Consequences and Treatment." London, 1886.

In weak and impaired action of the digestive organs, articles which readily ferment or turn acid should not be used; sugar, honey, starch or starchy substances, and fat should be avoided as much as possible. Bread should be stale or toasted. Fish, fowl, pork, veal, chocolate, strong coffee or tea, or an excess of water or of other liquids, should be interdicted. Wines and liquors should be sparingly used, if at all. In the weakened digestion of elderly people, articles of food which are easily assimilated should be selected, while indigestible food should be interdicted. Diminished appetite and secretion demand the most nutritious diet. Soft but concentrated food, broths containing malt extract, milk food, or some of the better forms of baby-food, are used with great advantage. The sedentary life led by such patients does not require much food, and little, if any, meat. A little wine or malt liquor will assist digestion, if it is otherwise suitable.

The question of infant-feeding is too large to go into here. The chief evils of bottle-feeding are (1) overfeeding, (2) too frequent feeding. (3) impure milk, (4) dirty bottles or nipples, and (5) want of uniformity in composition, quality, and temperature of the bottle. That food is best for the child upon which it best thrives and grows, presenting the appearance and physical characters of a healthy infant.

Anæmia and chlorosis require a highly nitrogenized diet, making the change gradually, as the stomach may be intolerant. Oysters, sweet-bread, underdone beef, with dish-gravy on potatoes or rice, with a glass of wine or extract of malt, are decidedly beneficial. Kumyss answers well, being both nutrient and mildly stimulant. An aërated milk or milk charged with carbonic-acid gas has been introduced by Professor Botkin and used extensively in Russia in cases of feeble digestion. It is said to be more palatable than ordinary cow's milk and to constitute a refreshing drink, especially in summer.

In neuralgia the nutrition is often below par, and in patients subject to neuralgia a generous dietary of easily assimilated blood-making food, with a glass of Hungarian or Egg Harbor red-wine at meals, and the free use of butter, cream, and other fats will often exert a decided effect. A cheap method of administering fat has been proposed by Dr. Mershinski. It consists in boiling together milk and lard for a considerable time, the resulting fluid containing a large proportion of fat, is generally well borne, and causes an increase of weight. It is thought to be well adapted to hospital patients suffering from malnutrition unconnected with disease of the stomach, intestines, pancreas or liver.

Diabetes in the mild form is easily controlled by limiting sugar or starchy foods, and leading an out-door life. Saccharine diabetes is sometimes intermittent, and its causes are not well understood; possibly it may result from several causes, some of which are slight and inconstant, others are grave. In the more serious form of diabetes mellitus, the withdrawal of starch and sugar from the dietary has very little effect upon the excretion of sugar, which evidently comes from the tissues, since emaciation rapidly continues. In either form, however, the diet is of great importance. There is a difference of opinion as to whether sugar and starch are tó be actually prohibited or only reduced to a minimum quantity. Da Costa allows some wheat-bread, in order to retain the co-operation of the patient, who may rebel against a too restricted diet. It is plausibly argued that absolute prohibition of starch will deprive the system of a necessary aliment and increases nitrogenous metabolism, so that a small and regulated allowance of amylaceous food will generally be found of advantage. The diminution in carbohydrates may be compensated by the ingestion of fat. Coffee or tea may be sweetened with glycerin or with saccharin. Gluten-bread for diabetics usually contains starch. A bread made from almond-flour has been recommended. Experiments have recently been made by Dr. W. Hale White in regard to the use of the soya bean in diabetes. This article is obtained from a Japanese plant. The beans are globular, and about the size of peas, which they resemble in taste. From their flour, bread and biscuit can be made and can be advantageously used as a substitute for wheaten bread as the bean contains but a small proportion of starch. The bread is palatable and Dr. White reports that it answers a good purpose. He thinks that it is of more avail than gluten-bread in reducing sugar in the urine and found no ill effects from its use. The beans can also be made into a soup. Another substitute for wheat is found by Erbstein in aleuronat, a vegetable albumen which contains about 80 per cent. of nitrogenous matter and only about 7 per cent. of carbohydrates. Aleuronat is a dry, yellow powder, free from taste or smell. From it both bread and soup can be made.

Digestive disorders in children are subject to dietetic treatment. Dr. G. Rheiner * warns against beginning the treatment with drugs; the dietetic treatment will remain the most simple as well as by farthe most rational. A child that has gastric disorder soon after being weaned, should be returned to the breast, as the best remedy, and a further trial made later. In bottle-fed babies, gastric disturbances are greatly relieved by washing the stomach, as introduced by Epstein, of Prague. After this procedure the stomach should be allowed to rest for a few hours, and some albuminized water, or barley-water, may be temporarily used. In intestinal dyspepsia, the diet should be looked after carefully before resorting to anti-diarrhœal mixtures. An exclusive diet of sterilized milk, or of barley-gruel with a suitable proportion of water, will usually bring the patient around all right. In constipation, oatmeal-gruel, thoroughly cooked, will, as a rule, produce one or two loose evacuations a day. Thus, by attention to diet, in many cases, we can get along without drugs, but where fermentation exists salicylate of bismuth and other antiseptics may be used with advantage.

In marasmus, unless the child be suffering with tuberculosis or malignant disease of the retro-peritoneal lymphatics, the best results can be anticipated from an abundance of good food suited to the powers of digestion and assimilation, fresh air, proper clothing, massage, and sleep.

Rickets has been shown by Cheadle to be due to improper feeding. The treatment is primarily and chiefly dietetic. Drugs are of minor import, though lime and lime-salts, warm clothing, fresh air and sunlight, with proper diet, may do good service. Fatty articles of food are useful, and the diet should also be rich in starches and earthy phosphates in a

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* *Journal American Medical Association*, from *Therap. Monatshefte.*

form easy of assimilation. In ulcer of the stomach those articles of food should be selected which are digested, either wholly or principally, in the intestinal canal. Farinaceous aliments best fulfill this indication and, together with eggs, should constitute the chief diet. Fruit, green vegetables and milk may also be allowed. Fruits should be cooked, and cabbage is prohibited. Grapes are useful at any time, and especially when constipation is present.

Obesity is a condition, in which the system has accumulated a large proportion of surplus nutritive material in the form of adipose tissue. The remedy is abstinence and abstemiousness. The bear retires for his winter's nap in a comfortable condition of obesity, but after four or five months have passed without eating, he emerges from his hollow tree a model of leanness. Dieting is recommended for obesity, but it should not consist in living solely on meat, as has been recently advised, nor in a dry diet with abstinence from water and other fluids as much as possible. Such measures will reduce weight, but they will be likely to cause serious disorder of the kidneys. It is better to simplify the diet, take systematic exercise, and reduce the hours of sleep, taking laxatives occasionally to stimulate the excretory organs. The free perspiration caused by active walking is better than that induced by the Turkish bath, which should be indulged in with moderation. The use of vinegar and other acids is said to reduce the surplus flesh, but this should not be followed to any great extent, for fear of bringing on digestive disorders or rheumatism. Mountain-climbing is the best form of exercise, but this should not be carried to the point of fatigue, until the muscles become firmer and more accustomed to out-door pursuits. Changes in the diet, like the increase of exercise, should be made with caution. If the individual is a hearty eater he should be directed to curb his appetite and gradually diminish his repasts. Articles containing much fat, starch or sugar must be very temperately consumed. Fat meats, cream, butter, vegetable oils, nuts, fat fish, farinaceous substances, fruits containing much sugar, beverages, such as beer, ale, and sweet wines, should be gradually discontinued. If milk be used at all it should be skimmed; buttermilk may be used, if fresh. No chocolate should be taken, and tea or coffee used without sugar, or sweetened with saccharin. The diet should principally consist of lean meat, poultry, game, eggs, green vegetables, and acid fruits. Not much bread should be eaten; gluten biscuits may be used as a substitute. The dietary which Mr. Banting followed in reducing his flesh from two hundred and two to one hundred and fifty-six pounds, in about a year's time, is as follows:—

Breakfast, at 9 A.M. Five or six ounces of either beef, mutton, kidneys, broiled fish, bacon, or cold meat of any kind, except pork or veal; a large cup of tea or coffee (without milk or sugar), a little biscuit or one ounce of dry toast,—making together six ounces of solids and nine of liquids.

Dinner, at 2 P.M. Five or six ounces of any fish except salmon, herring, or eels; any meat except pork or veal; any vegetable except potato, parsnip, beet-root, turnip, or carrot; one ounce of dry toast; fruit out of a pudding not sweetened; any kind of poultry or game, and two or three glasses of good claret, sherry, or Madeira,—champagne, port, and beer forbidden,—making together ten to twelve ounces of solids and ten of liquids.

Tea, at 6 P.M. Two or three ounces of cooked fruit, a rusk or two, and a cup of tea without milk or sugar,—making two to four ounces of solids and nine of liquids.

Supper, at 9 P.M. Three or four ounces of meat or fish, similar to dinner, with a glass or two of claret or sherry and water,—making four ounces of solids and seven of liquids.

In leanness, emaciation, and marasmus, the reverse course is to be followed to that recommended in obesity. Frequent eating of easily assimilated fatty and starchy foods, sweet-meats, an indolent life, warm baths, and several naps a day will be apt to develop the form, especially if the mind be cheerful in accordance with the old maxim, "Laugh and grow fat."

In the management of phthisis pulmonalis, or consumption, next to the climatic treatment, we would place the dietetic regulations. According to Professor Peter, cases of consumption frequently have their origin in disordered digestion, which lowers the vitality to such a degree as to make the organism susceptible to the disease, or, in modern terms, they are made to afford a proper culture-soil for the bacillus tuberculosis. Some relation evidently exists between insufficient food and consumption, and one of the evidences of recovery is the fact that the patient gains in weight. While the patient follows out the recommendations for the removal of leanness, he should not take too large an amount of fat, on account of the inability of the system to assimilate it, and the tendency to the occurrence of fatty liver. Much depends in phthisis upon the condition of the digestive apparatus. When appetite and digestion are unaffected it is well to adopt a system of forced feeding and to administer as much milk, eggs, meat, cream, butter and cheese as can be assimilated. When gastric disturbance has begun our aim should be to render the food palatable, and it should be given in a finely divided state. The administration of porter and ale is beneficial at this stage. If the patient can no longer partake of solid aliment without digestive derangements nourishment must be given in small quantities, but frequently, and the stronger spiritous liquors are demanded. Assimilation is favored by life in the open air and exercise or massage.

In what is known as latent or undeveloped gout, it is of importance that the condition be recognized and due regulation of the diet urged upon the patient by his medical attendant. Dr. William Roberts,* has called attention to this, in an able manner, in a recent contribution on the necessity of a revision of diet with advancing years. If the appetite remain good while there is a process of degeneration going on in the liver and kidneys, the power of taking food remains unaltered, while the assimilative powers are on the wane. Some form of nutritive disorder necessarily follows. There is frequently a tendency to stoutness; there is engorgement of the abdominal organs, and the signs of latent gout are likely to appear. The early recognition of this condition is very important, for thereupon depends the prevention or postponement of degenerative processes, which hereafter prove formidable. The most obvious indication is to lessen the quantity of food, and this is a task of varying difficulty.

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* *British Medical Journal; American Lancet*, December, 1891.

"Full feeders are rarely aware that they eat too much," says Dr. Roberts. Where the appetite is really strong and the digestion abnormally active, the patient finds it hard to resist the demands of hunger. In such cases, "the less concentrated forms of food are a useful resource (green vegetables, salads, thin soups), which help to fill the aching void without adding materially to the albuminoid and fatty ingredients of the meal. Tea and coffee are also serviceable in allaying an unseasonable craving for food. A stiff cup of tea or coffee, shortly before dinner, certainly takes the edge off a troublesome appetite. It is well, however, to proceed cautiously and tentatively in this direction, for the promptings of nature, however apparently to us misdirected, are not to be lightly set aside. The effects of a contracted diet should be carefully and patiently watched, with an open mind for every sign or suggestion, whether of warning, retreat, or of encouragement to advance. I need hardly add that, in regard to this middle-life revision of the dietary, as it may be termed, particular attention should be given to the quantity of alcoholic beverages. As a very general rule, the tolerance for these articles diminishes with advancing years, and it is necessary nearly always, with persons who have used them freely, to reduce their quantity when middle age is reached." The consumption of fruit is beneficial when a tendency to lithæmia exists, as the alkaline vegetable salts are converted into carbonates, which pass off in the urine.

With regard to the ability of the organism to assimilate nitrogenized food in fever, exact observations have finally established the conclusion that seemed warranted by experience. Huppert and Riesell maintained that the administration of albuminates intensified the febrile consumption, and is comparable to pouring oil on a fire. This was opposed by Uffelmann, and controverted entirely by some exact observations made by Bauer and Kunstle. A diet, therefore, consisting exclusively of carbohydrates is not desirable in fever, any more than in health, and, therefore, the addition of gelatin to farinaceous broths, or the administration of beef-juice, Bovinine, or Mosquera-Julia beef-meal is advisable, *wherever the digestive organs are capable of assimilating it*, and in quantities suitable to the condition of the digestive organs. In **typhoid fever,** a milk diet is preferred by most clinicians; but if this is insufficient, we may try Dr. Yandell's advice to allow unlimited bread and butter to the patient to satisfy the cravings of hunger, if he has any. Beef-tea has been finally superseded by various prepared foods containing peptones, beef-juice, or hæmoglobin, as already mentioned. Toast-water may be used to satisfy thirst; all the water drunk should first be boiled, and, if cloudy, strained, before giving it to the patient. On account of the duration of typhoid, the nourishment of the patient should be properly looked after, in order to keep up his strength. Stimulants should not be used as a matter of routine, but may be used sparingly, as an accessory food, during the decline of the fever.

The diet of persons suffering with albuminuria and Bright's disease should be carefully watched, bearing in mind the statement of Prof. Geo. Johnson, that "renal degeneration is a consequence of long-continued elimination of products of faulty digestion through the kidneys." The starting-point of Bright's disease, in the words of Fothergill, is "liver incapacity." This incapacity of the liver, which prevents it from properly assimilating albuminoids, may arise purely from mental worry or overstrain (Clifford Allbutt); it may be due to an excess of excrementitious material in the blood accompanying certain cachexiæ, as gout or lithæmia; it may possibly arise from defective kidney action, the result of scarlatinal or other poison. In any case, when the products of malassimilation pass through the kidneys they ultimately lead to degeneration of a granular character, which may or may not be attended by albuminuria. In some cases, the fault may be traced directly to overindulgence in animal food. The first step would be to restrict the amount of lean meat consumed, and direct the patient to avoid highly-seasoned food and spices. In many cases the best results are obtainable by placing the patients strictly upon a milk diet, which should be skimmed, or, at least, not Alderney. The food should be sparing in quantity, consisting largely of vegetables. Desserts may be allowed of a simple character, but the patient should be cautioned against free indulgence in the pleasures of the table. As the rule, alcohol is forbidden. Soups are useful, fish not objectionable. Cream, butter, and other fats are restricted. Gruels, broths, vegetables, biscuits, bread, crackers, and cheese may be mentioned among the articles which may be employed with advantage. Albuminuria is not the whole of Bright's disease, and may exist from dietetic causes, without degeneration of the kidneys. In a diet rich in albuminoid matter, the urine is apt to be albuminous. In such a case, the remedy suggests itself in due attention to the diet.

The subject of the dietary in various diseased conditions is admirably reviewed in J. M. Fothergill's "Manual of Dietetics," London, 1886. In the present place, we have room only for some useful formulæ, which may be employed in the sick-room with advantage to the patient. At the present time, the physician is not only expected to know what articles of diet are suitable for the patient, but he is also expected to be able to give precise directions how to prepare them, and, in emergencies, to step up and show the nurse or attendant how the thing should be done:—

## FORMULÆ FOR FLUID FOODS.

### *Beef-Tea.*

Take a pound of lean beef, free it from fat and fibrous tissue, cut into small pieces, place these in a crock or fruit-jar, with a good cover. Add to it a quart of cold water and ten or twelve drops of dilute hydrochloric acid, and stand in a moderately warm place for an hour; then let it simmer gently for two hours more, then strain and season with salt and pepper, if desired. It should be administered hot, an ounce or two at a time.

### *Beef-Essence.*

The same as above, except that no water is to be added to the meat, which is placed in the fruit-jar and the lid fastened down; the jar is then placed in warm water, which is gradually raised to boiling and kept at this temperature for three hours. It is then taken out, strained, and seasoned with salt.

### *Beef-Juice.*

Broil small steaks lightly, and then make incisions into them and press them in a lemon-squeezer or wine-press; the juice to be taken hot, with toast.

### *Raw-Beef Infusion.*

To a pound of beef, prepared as above, finely minced, add enough warm water to cover it and ten drops of dilute hydrochloric acid. Let it stand for two hours, at a temperature of ninety degrees, frequently stirring it with a glass rod. It should be kept on ice, and administered with milk or a little extract of malt.

### *Farinaceous Beef-Tea.*

To beef-tea, prepared as in the formula first given, add a little well-cooked oatmeal or cracker-dust, and serve hot. Barley-water or rice-water may be likewise enriched by beef-tea.

### *Beef-Broth.*

Take a shin of beef (cracked), and cook, in sufficient water to cover it, for two hours, with rice or barley and a potato. Season with a piece of onion, thyme, or parsley, as may be preferred. Allow it to cool, take off the fat, serve hot, with some of the rice or barley, if permitted, and salt or pepper as desired.

### *Mutton-Broth.*

Cut up two pounds of lean mutton, without fat or skin ; add a tablespoonful of barley, a quart of cold water, and a teaspoonful of salt. Let it boil slowly for two hours. If rice be used, instead of barley, it need not be put in until half an hour before the broth is done.

### *Chicken-Broth.*

Cut up an old fowl, remove the skin, and break the bones with a mallet. Cover well with cold water and boil slowly for three hours. Salt to taste. A little rice or tapioca may be boiled with it, if desired. Skim off the fat and add a little parsley, if desired.

### *White Soup.*

Add half a pint of boiled milk to an equal quantity of beef-tea and slightly thicken with flour. Some pieces of celery, or celery-seed, may be added to flavor, and strained out before serving.

### *Oyster-Broth.*

Cut into small pieces twenty-five oysters and put them in a chafing-dish ; let them simmer gently for ten minutes at a moderate heat ; skim, strain, add salt and pepper.

### *Clam-Broth.*

Take three large clams (having thoroughly cleansed the shells) and let them stand upon the stove until the shells begin to open. Drain out the liquor, add an equal quantity of boiling water, a teaspoonful of finely pulverized cracker-crumbs, a little butter, and salt to taste.

### *Hot Clam-Bouillon.*

Small quantities of clam bouillon may be conveniently and rapidly prepared by pouring about half an ounce of the preserved juice (Burnham's) into a cup and filling the latter to the brim with hot water. Some pepper may be added for the sake of flavor.

### *Oyster-Soup.*

Take a quart of milk and bring it to the-boiling-point and skim it. As it boils add a tablespoonful of flour rubbed smooth with an equal quantity of butter, stirring it until the milk is thickened by the flour. Then add twenty-five or more oysters and bring to the boiling-point, and remove at once or the oysters will be tough. For seasoning, one or two allspice may be added, with pepper and salt.

### *Oysters Chafed.*

Heat the chafing-dish and place in it a lump of butter; when hot, turn in the oysters and let them simmer for a few moments; remove, and add condiments to taste.

### *Rice-Soup.*

Take half a pint of chicken-stock and two tablespoonfuls of rice. Let them simmer together for two hours, then strain and add half a pint of boiling cream or milk, and salt to taste. Boil up at once and serve hot.

### *Flour Gruel.*

Mix a teaspoonful of flour with milk enough to make a smooth paste, and stir into a quart of boiling milk. Boil for half an hour, being careful not to let it burn. Salt and strain.

### *Flour-Soup.*

In a skillet place a lump of butter, and, when melted, add, with a dredging-box, sufficient flour to cover it; when this is thoroughly browned by the heat add a cup of milk and water, and season with salt while boiling. Strain and serve hot. This and the preceding are useful in bowel disorders.

### *Flour-Ball.*

Moisten a pint of flour with a couple of ounces of cold water, and tie up in a ball, tightly, in a strong cloth. Slightly moisten the cloth and sprinkle it with flour, and boil for ten hours. Then take off the cloth and let the ball dry in a slow oven for ten hours more. It is then ready for use in making

### *Boiled-Flour Gruel.*

Grate two tablespoonfuls of flour from the ball, mix it with cold water, to a smooth paste, and stir it into half a pint of boiling milk. Simmer about three minutes and sweeten. This is a good food for children while teething.*

**Predigestion of Food.**†—To the earnest advocacy of Dr. William Roberts, of Manchester, England, the profession is indebted for a clear conception of the great value of the partial digestion of food before administration. The process can be performed extemporaneously in any household, and is an inestimable boon in cases of profound debility of the digestive powers. The following directions are given by Dr. Roberts:—

### *Peptonized Milk.*

A pint of milk is diluted with a quarter of a pint of water and heated to a temperature of about 140° F. (or the diluted milk may be divided into two equal portions, one of which may be heated to the boiling-point and then added to the cold portion); the mixture will then be of the required temperature. Two or three teaspoonfuls of liquor pancreaticus, together with ten or twenty grains of bicarbonate of sodium (about half a small teaspoonful) are then mixed therewith. The mixture is then poured into a covered jug and the jug is placed in a warm situation, under a cosey, in order to keep up the heat. At the end of an hour, or an hour and a half, the product is boiled for two or three minutes. It can then be used like ordinary milk. By skimming the milk beforehand and restoring the cream after the final boiling, the product is rendered more palatable and more milk-like in appearance.

### *Peptonized Gruel.*

A well-boiled, thick, and strong gruel, prepared from any of the farinaceous articles generally used for that purpose (wheaten flour, oatmeal, arrowroot, sago, pearl barley, etc.), is poured into a covered jug and allowed to cool to a temperature of about 140° F. Liquor pancreaticus is then added in the proportion of a tablespoonful to the pint of gruel and the jug is kept warm under a cosey, as before. At the end of a couple of hours the product is boiled and, finally, strained.

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* This and most of the preceding formulæ are based upon those contained in the excellent "Text-Book of Nursing," by Clara S. Weeks. New York: D. Appleton & Co., 1885.

† For further observation on food, see author's papers on "Food and Diet in Health and Disease, including a Review of Many Prepared and Condensed Foods." *Medical Bulletin*, January, June, and July, 1892.

This preparation is not generally acceptable to invalids, but may be used in conjunction with peptonized milk, as :—

### *Peptonized Milk-Gruel.*

First, a good, thick gruel is prepared from any of the farinaceous articles just mentioned. The gruel, while still boiling hot, is added to an equal quantity of cold milk. The mixture will have a temperature of about 125° F. To each pint of this mixture two or three teaspoonfuls of liquor pancreaticus and twenty grains of bicarbonate of sodium are added. It is then kept warm in a covered jug under a cosey for a couple of hours, and then boiled for a few minutes and strained. The bitterness of the digested milk is almost completely covered in the peptonized milk gruel.

### *Peptonized Soups, Jellies, and Blanc-Manges.*

In order to vary the regimen and increase its palatability, Dr. J. Milner Fothergill describes* other peptonized dishes which may be prepared. A soup may be made by using peptonized gruel, which is quite thin and watery, instead of simple water, for the purpose of extracting shins of beef and other materials employed for the preparation of soup. Jellies can be made by simply adding the due quantity of gelatin or isinglass to hot peptonized gruel, and flavoring the mixture according to taste. Blanc-manges may be made by treating peptonized milk in the same way and then adding cream. In preparing all these dishes the operation of peptonizing the gruel or the milk must be completed, even to the final boiling, before adding the stiffening ingredient.

### *Peptonized Beef-Tea.*

Half a pound of finely minced lean beef is mixed with a pint of water and twenty grains of bicarbonate of sodium. This is simmered for an hour and a half. When it is cooled down to about 140° F., a tablespoonful of the liquor pancreaticus is added. The mixture is then kept warm under a cosey for two hours and occasionally shaken. At the end of this time the liquid portions are decanted and boiled for five minutes. Beef-tea prepared in this way is rich in peptone, and its nutritive value in regard to nitrogenized materials is about equivalent to that of milk. When seasoned with salt it is scarcely distinguishable in taste from ordinary beef-tea. As a convenient method of peptonizing milk, Messrs. Fairchild Bros. & Foster, of New York, have now on sale "peptonizing tubes," each of which contains sufficient extractum pancreatis to peptonize one pint of milk.

### *Kumyss.*

Kumyss, or milk-wine, originally made by the Tartars by fermenting mares' milk, is now prepared on a large scale in this country from pure cow's milk. It is deservedly esteemed as a combined stimulant and nutrient, very beneficial in wasting conditions, and, from the carbonic acid which it contains, efficacious in allaying irritability of the stomach. Kumyss may be made at home, according to the following directions of the late Prof. S. W. Gross: "Dissolve half an ounce of grape sugar in four ounces of water. Dissolve twenty grains of yeast-cake in four ounces of milk. Pour both into a quart bottle and fill nearly to the top with milk. Cork tightly, fastening the cork with wire. Put into a cool place and shake two or three times daily for three days. Keep for use no longer than six days. A champagne-tap introduced through the cork is necessary. Kumyss contains about 16 per cent. of alcohol."

### *Kumysgen.*

Under the name of Kumysgen, Messrs. Reed and Carnrick offer a preparation by which kumyss can be readily generated whenever desired. From the mode in which it is put up it will keep indefinitely. It is made from fresh, sweet milk, and contains fully 30 per cent. of finely-subdivided casein.

**Rectal Alimentation and Nutritive Enemata.**—It sometimes becomes necessary to abandon for a time the usual route for the administration of food, as in cases of gastric ulcer, persistent vomiting, and athrepsia in infancy. Under such circumstances we may resort to the bowel, and introduce nutritive substances by injection. It is considered advisable to add a certain amount of pepsin or pancreatin to the prepared food in order to facilitate the formation of peptones and the absorption of albuminoids. Milk-punch and beef essence or infusion may be used, with advantage, or sterilized milk, to which pancreatin and soda are added just before introduction into the bowel. Dr. Spencer has suggested nutrient suppositories made of beef chopped up finely mixed with fresh pancreas or with pancreatic extract.

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* "Indigestion, Biliousness, and Gout in its Protean Aspects." Part I. By J. Milner Fothergill, M.D.

The quantity of fluid food used at each injection should not be more than two to four ounces, depending upon the capacity and toleration of the patient. In infants, from half an ounce to an ounce is the limit. Irritability of the rectum may be overcome by a preliminary irrigation with cold water, or the use of an opium suppository, or laudanum injection. The nutritive enema may be repeated every four hours, and may constitute the sole reliance for nourishment during a period extending over several months.*

## PSYCHOTHERAPY; HYPNOTISM AND SUGGESTION; METALLOSCOPY AND METALLOTHERAPY.

Psychotherapeia (ψυχη and δεραπευω), "the treatment of diseases through the mind," plays a most important part in the ordinary everyday practice of medicine. The influence of the mind upon bodily functions is so great that every experienced, intelligent physician is glad to enlist so potent an auxiliary, to some extent at least, in his treatment of diseased conditions. The eminent Dr. Rush always made a point, wherever possible, of explaining the action of the medicine which he prescribed for a patient, who, being thus made acquainted with the expected results, himself unconsciously favored their occurrence by what is known as "expectant attention." The confidence that a doctor inspires is generally acknowledged to be a powerful aid to his therapeutics. His hearty greeting acts like a stimulating cordial upon the drooping spirits of his patient, who takes fresh courage from his cheerful presence. This power of influencing others so as to affect their mental state or physical condition has been known and practised since the most remote period. In the early history of medicine, when the duties of physician and priest were combined in the same person, many superstitious rites and ceremonies were employed in the treatment of disease in order to impress the mind of the patient and favor his recovery. The practice of the Royal touch for the King's evil, or scrofula, which continued in England up to the time of Queen Anne, is a recent illustration, and the ancient custom of wearing amulets to ward off disease has not yet entirely disappeared from even the most civilized communities. The wearing of iron rings for rheumatism, amber beads to prevent croup, horse-chestnuts in the pocket to protect from gonorrhœa, or gold rings in the ears to cure epilepsy, and other superstitious observances are of the same character. On a larger scale, we observe the so-called faith-cure or Christian science, which could only find supporters among persons absolutely ignorant of physiology and intensely credulous and superstitious. The only proper criticism upon the latter is that "it is not Christian, and decidedly not science." It is merely an outbreak, under another name, of the doctrines of the "Peculiar People" in England, whose practice of neglecting proper treatment for the sick and maimed has come frequently before the courts and has been repeatedly condemned, and, where death has resulted, verdicts of homicide have been rendered. In extreme cases there is, underlying this delusion, undoubtedly a strain of insanity, and some of the most ardent believers in the mind- or faith-cure are destined to eventually find their way into an asylum for the insane. While under the influence of this delusion, however, they are insensible to argument or reason, but, by their persistence and confidence, they attract unreasoning, weak-minded people, especially among the social class suffering with intellectual *surménage* and mental dyspepsia.

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* "Rectal Alimentation and Medication in Diseases of the Skin," by J. V. Shoemaker. Transactions of the Ninth International Congress, vol. iv, p. 170.

In order to properly approach this subject the student should read Tuke's admirable essay, entitled "Illustrations of the Influence of the Mind on the Body in Health and Disease, designed to Elucidate the Action of the Imagination,"[*] and also Pettigrew's "Superstitions in Medicine Connected with the History and Practice of Medicine and Surgery,"[†] and, especially, the little work of Sir John Forbes, on "Nature and Art in the Cure of Disease," each of which is classical and should be part of the necessary course of reading for every candidate for the medical degree.

In every system of medicine practised among rational beings, the action of the mind is not to be overlooked or ignored. Medicines that are repulsive to the senses of the patient, and that are taken under protest, are likely to excite disgust and nausea even if they are not immediately rejected by the stomach. Such remedies, whenever possible, should be substituted by other pharmaceutical preparations having the same physiological action, but more agreeable to the palate. The latter form will not only be taken more faithfully by the patient, but he will be more ready to acknowledge that they are doing him good, whereas he is sure that the other will not benefit him and is anxious to discontinue it,—an argument for palatable prescribing which should not be despised.

**Hypnotism** (ὕπνος, sleep), or artificial trance, is a condition accompanied by loss of consciousness and power of voluntary motion, but with preserved intelligence and the ability to perform muscular movements under the verbal directions of another person. Suggestion is the name given to the process of instructing the patient in this way to do certain things. The patient apparently surrenders entirely his individual will and volition, and becomes an automaton under the direction of the operator. It has been said that the effects may remain even after the hypnotic sleep has passed off, and that patients will proceed at an appointed time to perform certain actions, suggested to them while in the hypnotic sleep, of which they retain no recollection when awake. It has been positively asserted that subjects have been hypnotized and in-

[*] London, 1884. Second edition.

[†] Philadelphia, 1844.

structed, while in this condition, to go on a certain date to a named place and there commit a crime such as stealing a watch or attempting to kill a person with a knife, and that they have afterward obeyed the suggestion, which assumed the form of an uncontrollable impulse. The relation of this to medical jurisprudence is very evident, and at present it is attracting considerable attention. There is a therapeutic application, however, which deserves some consideration. In some neurotic disorders, characterized by pain, spasm, paralysis, or paræsthesia, it has been demonstrated that, by hypnotism and suggestion, these symptoms can be made to disappear either temporarily or permanently. The phenomena of transference, by which a symptom (pain, paralysis, contracture) is removed from one part of the body to another, or even from one patient to another, is also of much interest to the pathologist and clinician. The effects of certain remedies, it was even claimed by Luys, may be produced simply by suggestion, without administering them, but this was shown to be a fallacy by Dujardin-Beaumetz. Closely related to this subject is metalloscopy and so-called metallotherapy, which will be considered somewhat in detail at the conclusion of this section.

Dujardin-Beaumetz, in a lecture* on "Suggestion in Therapeutics," admirably summarized our knowledge of the medical relations of hypnotism. He traces it to the desire for the marvelous and mystical, which has always exerted a dominating influence upon the mind of man. The fakirs of India have employed it under one form or another, from time immemorial. The fakir, in truth, is a charmer,—that is a practicer of suggestion,—and he develops in the individuals surrounding him phenomena of hypnotism and somnambulism. This also appeared in Europe under various forms, as the thaumaturgists, the demoniacs, the rosicrucians, and performers of miracles and of sorcery, which occupy so large a place in the history of the Middle Ages. At a later period, we observe these practices assuming a scientific tendency; for, although the suggestive processes are always the same in character, whether performed by Paracelsus or Charcot, there is in our own day a desire to discover for the phenomena a scientific explanation. Paracelsus in the sixteenth century assumed the existence in man of a special animating principle to which he gave the name of animal magnetism. This explanation was adopted by his successors, Van Helmont, Mesmer, and others, under various names (od-force, mesmerism, etc.), and this doctrine of magnetism was professed by many believers. About fifty years ago (in 1842) Dr. James Braid, of Manchester, England, succeeded in modifying this opinion among scientific men, by showing that by the fixation of the vision and attention upon some object, usually a brilliant one, it was possible to provoke the same series of phenomena, which now received the name of Braidism, or hypnotism. For a long time afterward the facts reported by Braid failed to attract much attention, althought reports were occasionally published from surgeons of operations performed during the hypnotic state. It is not until we come to the communications of Lasègue, in 1865; of Charles Richet, in 1875; and to the numerous studies by Charcot from 1869 to the present time, that we find a due recognition of the phenomena of hypnotism in their medical relations. Luys ascribes these phenomena to fascination, such as is produced by a revolving mirror which is moved rapidly before the eyes of the subject upon whom this procedure is employed. Whether caused by hypnotism, suggestion, or fascination, Dujardin-Beaumetz stated that a series of phenomena are produced in certain patients which may be summarized under three principal types:—

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* *Bulletin Générale de Thérapeutique.*

1. The cataleptic state.
2. The lethargic state.
3. The somnambulistic state.

The latter is the suggestive phase of hypnotism. Bernheim and Liébault admit six categories of such hypnotized patients. In all of them the will of the operator takes the place of that of the subject. In the beginning of this provoked slumber there is somnolence and heaviness, and the power of suggestion is feeble. It is, however, sufficient, for example, to prevent the patient from lifting his eyelids without the permission of the operator. In the first and second stages, the patient may be acted upon after the manner of automatic phenomena; subsequently, in the further stages, we arrive at true suggestion, when the patient is related only to the hypnotizer, who makes him execute movements or suggests to him illusions or hallucinations. These nervous phenomena may vary in form in different subjects, and also in the same subject, and the results are also determined to a considerable degree by the expertness of the operator.

The means of evoking hypnosis or the hypnotic sleep are of the most varied character. For the passes of the magnetizers, Braid substituted fixation of the glance upon some object,—something brilliant, such as a bright button, or even the finger of the operator. At Charcot's clinic the sense of hearing is appealed to; the noise of a gong determines the hypnotic state as well as the production of a bright light. In a word, every sensorial impression may he utilized.

The Abbé Faria, in 1814, was the first to protest against the idea of a magnetic fluid and to affirm that the slumber of the hypnotized was produced by suggestion or by will. He fixed the glance of the subject, and showed the back of the uplifted hand; then he advanced several paces, and suddenly lowered his hand, ordering the subject to sleep. This is the method of hypnosis by suggestion which is adopted by the school of Nancy.

Dujardin-Beaumetz produced sleep by fixation of the gaze and occlusion of the eyes.

As for awakening the patient, this may be done in a number of ways. The usual method is to tell the subject to awake, raising the voice in a tone of command. The same result may be obtained by breathing lightly upon the face of the hypnotized.

The clinical authority from whom the foregoing has been quoted classes patients, who are to be subjected to hypnotism as a therapeutic resource, into three classes: In the first class are the hysterics; in the second the neurasthenics, the illy balanced, the hypochondriacs, the nervous; finally, the third comprises all those suffering from organic affections with lesions, and in whom the nervous element plays only an absolutely secondary rôle. Suggestion, or hypnosis, has always produced its most positive effects in the first group. This group is very numerous, and includes men as well as women. Male hysteria occurs not alone among the well-to-do, but also in the laboring classes. On this soil flourish a number of pseudo-maladies, which, in their manifestations, assume the form and course of diseases of organs, producing gastric or pulmonary hysteria, for instance, which closely resemble organic affections. All of these manifestations can be made to disappear by hypnotism and suggestion.

It is among this class of suggestionable hysterics that we find such brilliant examples of successful hypnotic anæthesia, during which tedious surgical operations may be performed or accouchement accomplished. A large number of cases have been reported by surgeons of the use of the hypnotic sleep since Esdaile published his records of several thousand cases in India. Owing to its simplicity, it is admirably adapted to short operations, such as extracting teeth.

The second group of cases—the neurasthenic, the hypochondriacal, and the unemployed—are less influenced by suggestion. With such neuropathics the personal influence of the physician and the assurance with which he prescribes his remedies have more effect than the remedy itself. Here lies the success of little parti-colored granules or miniature powders, "over which certain physicians make magnetic passes before administering them"; and, we might add, here is the secret of the financial success of some men whose ignorance is only equalled by their assurance.

As to the third group, it must be stated that, in the presence of actual lesion, suggestion has a very limited field. Pain may be removed for the time and the general state improved by the assurance of an early recovery, the effects of a remedy may be enhanced by expectant attention, "and every new remedy has a phase of success which belongs to the domain of suggestion."

The proportion of patients who are amenable to suggestion is set down very differently by various authorities. Dujardin-Beaumetz claimed that the number has been very much overestimated. Even among the first class of hysterics, who are the most susceptible to this mode of treatment, he finds a certain number not hypnotizable; or, at least, there are, among hysterical subjects, many affections which cannot be ameliorated by suggestion, so that the actual proportion of those curable by this method is much smaller than has been claimed.

The recent International Congress of Hypnotism, held at Paris in 1891, is an illustration of the growth of this therapeutic method of late years and its present magnitude. Dr. Ernest Hart, in commenting upon the schools and doctrines of hypnotism, pointed to the published addresses and discussions at this Congress, which he holds are sufficient to show that all is not yet clear, even as to the nature, not to say the grouping, of the phenomona which are included under the name of hypnotism. The school of La Salpêtrière maintains that, in what it calls *le grande hypnotisme*, there are always physical phenomena which arise independently of any suggestion; while the school of Nancy holds that these phenomena are superadded, and only make their appearance as the result of a suggestion, voluntary or not. It was Charcot who put the whole subject upon a scientific basis, and who definitely disposed of the claims of animal magnetism. Following him, are a number of able observers in different countries of Europe who have contributed greatly toward firmly establishing hypnotism within the domains of science. *Le grande hypnotisme* constitutes the most perfect and typical form of hypnotism. The whole doctrine of Charcot may be expressed in the following propositions of his favorite pupil, Babinski: First, the physical characters observed in the hypnotism of certain subjects allow the absence of simulation to be affirmed; secondly, hypnotic phenomena may effect a special grouping in three distinct states; thirdly, the physical phenomena of hypnotism may be developed independently of any suggestion; fourthly, hypnotism in its most perfect forms must be recognized as a pathological or diseased condition. On the other hand, the doctrine of the school of Nancy may be summed up in the single word "suggestion." M. Bernheim offers the following definition: "The hypnotic state is that peculiar, induced psychical state which augments, in divers degrees, suggestibility; that is to say, the aptitude to be influenced by an idea accepted by the brain and to realize it." The school of the Salpêtrière holds that, in any case, healthy, well-balanced individuals cannot be hypnotized; and that those who are capable of undergoing special psychical transformation are persons who have a neuropathic constitution. This seems like an important fact to establish, and indirectly confirms the opinion already quoted by Dujardin-Beaumetz that hysterical subjects furnish the greater number of successful cases.

Hypnotism may give rise to accidents in certain cases, and, after hearing an address by Dr. Ladame, the Congress demanded that public displays of it should be forbidden, and that it should be considered as a therapeutic method and reserved for physicians alone. At Nancy the doctrine is taught that crime may be committed by a person under the influence of suggestion as the result of such influence. Dr. Gilles de la Tourette declared his belief that the only possible crime which might be committed is on the person hypnotized. Hypnotism is directly dangerous because it may end in completely upsetting the intelligence of the subject, and indirectly by the excessive influence which it gives to the operator over the subject, of which the limits have not been determined. A death has been ascribed to hypnotism. The accident happened to a young Hungarian lady, who was hypnotized by a layman with a view to obtaining information by "clairvoyance." The patient seemed exhausted and after replying to a question "she fell from her chair with a hoarse cry; her tongue protruded from her mouth and she became collapsed. Her head was lowered, clothing loosened, artificial respirations performed after Sylvester's method and ether injections given; later she was wrapped in blankets, but she died almost in a few seconds in spite of all." It was considered, after an autopsy, that death was caused by acute anæmia of the brain, incident to the hypnotic state, with syncope and heart-failure. It may, indeed, be questioned whether the unfortunate result was directly due to hypnotism since Krafft-Ebing writes that the victim was probably so constituted that death might have been hastened when awake by a violent psychic force. At all events, the possibility of such an occurrence should enjoin caution.* Hypnotism may influence the actions of hysterical subjects, but it is difficult to ascertain up to what point this proceeding can with advantage be employed to correct the morals of children or evilly-disposed or criminal persons. Doubt is still very permissible on this point, notwithstanding the long list of observations which are found in Bernheim's book. Beyond doubt, however, hypnotism is capable of rendering services in the study of experimental psychology, and much has already been accomplished in this direction.

**Hypnotism in General Practice.**—It is a proper question to ask, How far may hypnotism be utilized by the general practitioner? In the first place, it is a method which savors of charlatanism, and in a large number of cases is not applicable. As Dujardin-Beaumetz has shown, it is serviceable principally among hysterical subjects. In other words, it is likely to be an experiment doomed to failure in the very class of patients whose esteem is most desired,—the intelligent, well-balanced, and sensible ones. It is not surprising, therefore, that it has been avoided by the mojority of physicians. Nevertheless, in selected cases, it can be resorted to as a therapeutic expedient with brilliant results. Dr. Joseph Collins, of New York, reports five cases in the *New England Medical Monthly* (April, 1892), and directs attention to the fact that in suggestion we have a valuable corrective agency for children who have acquired or inherited criminal tendencies. In the cure of chronic inebriates it certainly deserves a trial In some cases of insanity the outlook for suggestion is promising. It is among functional nervous diseases that we find the greatest field for this measure. "It is for the various paralyses, hyperæsthesias, contractures, spasms, convulsions, and other nervous ailments of non-demonstrable organic lesions where it has its greatest use. Supposed diseases, dread of diseases, disorders of digestion and other functions will, undoubtedly, in many instances, disappear under the influence of mental suggestion."

The susceptibility of children to hypnotism was considered recently by Bérillon, in a paper,† before the Paris Society of Hypnology. It is a matter both of scientific and medico-legal importance. The author claims that 80 per cent. of children, from every class of society, may be hypnotized at the first or second trial. The most singular part is, that children with the most marked hereditary nervous taint are the most difficult to hypnotize. Epileptics are highly susceptible. The author recommends that suggestion be made use of in the treatment of such conditions as insomnia, night-terrors, kleptomania, onanism, and other vicious habits.

In his presidential address before the Colorado State Medical, Dr. J. T. Eskridge‡ reviews the entire subject in a masterly manner. He declares that by suggestions during the stage of hypnosis he has been able te improve digestion, increase the appetite, and relieve constipation. As a rule, tired and nervous feelings can be abolished by hypnotic suggestion. Slight despondency may be overcome and raised to hopefulness. Headache, if not too severe, is readily relieved; but he had not succeeded in relieving acute pain, such as toothache or trigeminal neuralgia. Stammering has been treated with marked success. Morbid fear of insecurity may be beneficially influenced. With regard to bad habits, Dr. Eskridge states that in no case had he succeeded in breaking up any bad habit except by repeated hypnotic suggestion. Experience has taught that the impressions made by hypnotic suggestion are not very permanent at first, and are only made so by repeated suggestion, extending over a considerable length of time. Dr. Eskridge offered the following as the conclusions of his study of the subject:—

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* *Journal of the American Medical Association*, October 27, 1894.

† *Gaz. Médicale*, July 25, 1891.

‡ *New York Medical Journal*, August 1, 1891.

1. That hypnotism is real, subjective, and disassociated from any mysterious influence formerly supposed to be exerted by the hypnotist over the subject.

2. That its therapeutic value depends upon the mental impressions made during hypnosis, the latter rendering one more impressionable at the time.

3. That much that is accomplished by the aid of hypnotism may be obtained by repeated impressions without hypnosis.

4. That hypnotism may be attended by certain dangers to the hypnotist, the subject and the community; but that, so far as the reputation of the hypnotist or the health of the subject is concerned, proper precautions will enable us to prevent any untoward effects, leaving numerous dangers of a medico-legal nature to be guarded against when hypnotism is practised by unprincipled persons.

5. That whether or not the therapeutic value of hypnotism is greater than the dangers that cannot be prevented from its practice is not determined, and should receive careful attention at the hands of competent investigators, whose minds are not likely to be unduly biased by skepticism or enthusiasm.

6. That no one should be allowed to hypnotize without a license from the State to employ hypnotism.

7. That the practice of hypnotism should be limited to physicians and other scientific investigators.

8. That no one of questionable reputation should be given a license to hypnotize, and any one so licensed should forfeit it on being convicted of crime.

Dr. C. H. Hughes,* of St. Louis, in a discussion before the New York Medico-Legal Society, declared that public exhibitions of hypnotism should be prohibited by law. Hypnosis, according to him, is an abnormal function of the brain, and the practice of inducing it should not be encouraged when the subjects were persons who were very impressionable. Dr. Nolan † reported a case of insanity following hypnotism in a soldier, the victim of a neurosis produced by debauchery. Profound hypnosis was rapidly induced by gazing at a bright object. From this state the patient did not completely emerge until the lapse of nearly four months. Throughout this period of stupor the patient was disturbed by a recurring visual hallucination of an old hag, who seemed to rush toward him. Dr. Julius Solon ‡ also reported a case where an amateur at a friend's house, volunteered to hypnotize a fellow-visitor, and, after two trials, succeeded so well that the subject grew extremely excited, lost the power of speech, and then passed into a condition of catalepsy; subsequently he had severe convulsions. He had been hypnotized by being made to look at a diamond ring, and afterward the sight of anything glittering threw him into a state of violent excitement. He went into a condition of grave hysteria, with maniacal excitement, during which he had numerous convulsions; in the intervals he would sing over, song after song, apparently all the songs he knew, and as long as one remained unsung nothing could stop him. At the end of a fortnight he had an attack of fever, followed by copious perspiration and dyspnœa; a few days later he had a similar attack, and after this he declared himself well. From first to last he was seriously ill for three weeks. The cause of the fever was ascribed by his physician to inflammation of the anterior part of the brain.

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* *British Medical Journal*, April 11, 1891.
† *Journal of Mental Science; Druggists' Circular*, May, 1891.
‡ *New York Medical Journal*, March 14, 1891.

Dr. Moll, of Berlin, author of a book on hypnotism in the Contemporary Science Series, speaks favorably of suggestion in childbirth, where it may be used always without damage, and sometimes with most signal efficacy in relieving suffering. Dr. Moll attaches the greatest value to this as a means of breaking up habits, such as morphinomania, drunkenness, etc., which the patient is no longer able to control.

Dr. Hamilton Osgood* also speaks favorably of hypnotism, and believes that the assertions of the leading hypnotizers of Europe, with reference to the harmlessness of this treatment, when intelligently applied, are true. The possibility of idiosyncrasy must be always borne in mind, however, although Osgood has never met it in any of the patients whom he has hypnotized; nor have any, according to him, who confine themselves to the Nancy method. The dangers lie rather in insufficient technical knowledge than in hypnotism itself, and Osgood joins Moll and others in urging the abstaining from suggestions which do not accord with the normal functions of the organism.

Dr. J. Leonard Corning,† of New York, in discussing the therapeutic value of hypnotism, declares that the rôle it is destined to play is a subordinate one; it is a collateral expedient, invoked largely with the view of rendering the patient more tractable and amenable to other elements in the plan of treatment.

It should be borne in mind, as insisted upon by the late Dr. George M. Beard, that the phenomena of suggestion are not caused by superior will-power of the hypnotizer. There is no transfer of mental force; there is merely a passive condition of the subject, which makes him act automatically, in a manner suggested by another person, who has no power or control beyond the mere suggestion of the idea.

Hypnotism and the law has been the subject of two essays read before the Medico-Legal Society of New York,—one by Clark Bell, Esq., and one by John J. Reese, M.D.‡ The position taken by the former is that the bar and judiciary are in duty bound to carefully and calmly investigate, and, so far as possible, define the phenomena and place its true limitations regarding personal and certainly criminal responsibility. He would advocate restricting its use to qualified investigators, but would oppose limiting it to medical men. Dr. Reese regards it as a true pathological state, even though unaccompanied by any demonstrable change of structure. There should be, in his opinion, legal surveillance over private experiments and public exhibitions.

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* *Boston Medical and Surgical Journal*, 1891.

† *Journal of American Medical Association*, December 13, 1890; from the *Medical Record*.

‡ *Medico-Legal Journal*, March and September, 1891.

In mental disease, Dr. Voisin* has had good results in conquering hallucinations, overcoming delusions, and in quieting acute mania. He was able to induce hypnosis in about 10 per cent. of his patients.

The editorial in the *Medical News* (October 10, 1891), on the therapeutic value of hypnotism, casts some doubt upon the advisability of substituting one neurosis for another, and suggests a strong relationship between experimental hypnotism and human vivisection. "We must have a better psychology and an infinitely more perfect pathology and pathogeny of psychic disease before we shall be capable of intelligent use of hypnotic control and suggestion as justifiable methods of cure." Dujardin-Beaumetz, in the lecture previously referred to, sums up the value of this method in the statement that "psychotherapy will never constitute more than an exceptional resource in the practice of our art, if we would limit it to the practice of hypnotism, properly so-called," since there will always remain a large pathological group of organic affections against which we must employ special medication, and in which hypnotism can never play any rôle. "To suppose, for a single instant, that it would be possible, by mere affirmation, to cause the disappearance of the entire train of morbid symptoms is an illusion, and, worse, an error." Ernest Hart† very fairly sums up the whole matter, as follows :—

"Hypnotism is a pathological modification of the nervous system, which always indicates that the subject belongs to a neuropathic class. The complete and typical form of hypnotism described by Charcot is rare. Suggestion plays a considerable part in hypnotic phenomena, but there are somatic phenomena which are independent of it. Hypnotism may frequently be dangerous, and very rarely useful. It may be the cause of crime, or of mental disorder; it can really cure no disease not more easily curable by simpler and less dangerous methods. A considerable number of facts attributed to it which have most impressed the public imagination, such as the actions of medicines at a distance, the so-called telepathic communications, or communications made without speech, and the clairvoyant phenomena sometimes described, are mere errors of experiment arising from insufficient precautions and a too vivid imagination. Precisely those phenomena which have been most publicly talked about and excited most interest in 'psychical circles,' so-called, are the least real. The hopes which the therapeutic hypnotist aroused have not been realized, and any expectations of producing by hypnotic methods any desirable moral or mental effect rest upon a totally inadequate basis of fact, and are far from being promising." Dr. Hart, in his monograph on "Hypnotism, Mesmerism and the New Witchcraft," alludes to the dangers which may arise from an abuse of hypnotic influence and calls attention to its actual alliance, in many cases, with humbug and fraud. He demonstrates that neurotic individuals have been trained for purposes of exhibition and so-called scientific experimentation.

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* "Proceedings of Congress of Experimental Hypnotism, 1889." *Boston Medical and Surgical Journal*, September 5, 1889.

† *British Medical Journal*, March 28, 1891.

**Metalloscopy and Metallotherapy.**—The possibility of affecting bodily functions by the near approximation to the surface, or actual contact, of various metals has been a belief of mankind from a very remote period, and doubtless the phenomena exhibited by magnetic iron-ore had much to do with giving it something like a foundation in fact. In the history of this subject the name of Dr. Perkins, of Connecticut, will always occupy a prominent place, similar to that of Paracelsus in the early development of hypnotism, and the parallel is not an unjust one to the American. Perkins arranged a combination of metals in the form of a cylinder which could be grasped in the hand or passed over the surface of the body. By the application of these "tractors," as they were called, the morbid process was believed to be drawn out; he applied them with remarkable results, and many certificates of cures were obtained. This method had such success here that it was introduced into England, where it was received with great enthusiasm. It became at once very popular. Crowds of all classes resorted to the Perkinsian Institute, and wealth poured into the coffers of the shrewd proprietor, until Dr. Haygarth opened an opposition institution, and demonstrated to the world that he could obtain equally marvelous results from imitation tractors made of wood. In other words, Perkins' method was not metallotherapy, properly speaking, but an illustration of the influence of the mind over the body and of the curative effect of the imagination. Modern metalloscopy and metallotherapy are further illustrations, in all probability, of the action of this potent therapeutic adjunct under a more scientific dress.

Dr. Burq, in an inaugural thesis in 1851, called professional attention to the curative effects of metals in the form of plates, when applied to the skin in cases of paralyses of motion or of sensibility occurring in hysteria. The same metal is not applicable to all cases,—one being benefited by silver, another by gold, copper, or some other metal. He claimed that the internal administration of the appropriate metal to the given case would likewise produce favorable results. The detection and determination of the particular metal appropriate to each individual he donominated "metalloscopy," and the use of metals in this way "metallotherapy." This is quite different from the external use of magnets, to which attention has already been directed. Among the phenomena claimed by Burq to be produced by a piece of metal, such as a coin, properly selected according to the special sensibility of the subject, when placed in contact with the skin, is return of normal sensibility in permanent hemianæsthesia (hysterical) in from ten to twenty minutes, through a space of some extent above and below the point of application. Numbness, tingling, and other disorders of sensation precede the return of sensibility in the area immediately adjacent to the metal, and this gradually extends until the whole side returns to the normal. At the same time an elevation of the temperature recognizable by the thermometer and an increase of muscular power takes place. Where sight, hearing, taste, and smell are also in a condition of anæsthesia, as the general sensibility is restored these functions also become normal. A commission appointed by the Paris Academy, with Charcot at its head, having been appointed to examine into their claims for metallotherapy, confirmed them, and added what is known as "the phenomenon of transfer," by which is meant that with the restoration of normal sensibility upon the affected side there is a decline, to a greater or less degree, of the sensation of the corresponding area upon the opposite side. The phenomenon observed and the results obtained by the commission were of such a positive character that Charcot was led to ascribe them to electrical currents stimulated by the contact with the metal. Such currents could only be an exaltation of the normal intercapillary electrical phenomena, since one metal could not originate an electrical current outside of the body even when in contact with it. Professor Westphal, of Berlin, after a careful investigation of the subject, published his results, which, on the whole, were corroborative of those of Charcot and Burq. Dr. Hughes Bennett obtained equally striking results from other substances than metals.

The method of application is to select disks, or large coins, or pieces of wood coated with metal, and apply them to the affected limb either as a bracelet or a single plate kept in position with a bandage. The effects follow in a few minutes, so that experiment will readily determine which metal is to be used. As the rule, an individual is susceptible to one metal only. The order of usefulness is: iron, copper, gold, silver, tin, platinum.

Besides hemianæsthesia or paralysis of hysterical subjects, cures of writers' cramp, chorea, and neuralgia have been reported. When the metal to which the patient is sensitive is discovered, it is sagely recommended to continue the treatment by the internal use of a salt of the same metal. In giving this advice Bartholow follows Burq's practice, already referred to.

The attentive student of the preceding section on hypnotism and suggestion will find a sufficient and fully-scientific reason for the above phenomena, without invoking any mysterious or occult influence of metals in the treatment of disease, other than in the sense in which Burton, in his celebrated "Anatomy of Melancholy," applies to metallotherapy in his observation to the effect that gold is a potent remedy for lowness of spirits.

Within the last few years the subject of metallotherapy has almost entirely disappeared from medical journals, and is omitted from our principal text-books.

## HEAT AND COLD AS THERAPEUTIC AGENTS.

**Heat,** as measured by the thermometer, is a purely relative term. Living human beings have a normal standard of heat furnished by the surface temperature of the body, which varies a little at different points, but may be roughly stated to be about 100° (F.), or a little less (98.4 to 98.6 in the axilla, a fraction higher in the mouth or rectum). In certain states of the system this may be exceeded by as much as ten or twenty degrees, and, if this continues for a greater or shorter period, the patient is commonly said to have fever, or pyrexia (πῦρ, fire). The bodily temperature, on the other hand, may fall below the standard in collapse, coma from alcohol, loss of blood, starvation, or cancer. Vaso-motor paralysis with dilatation of the blood-vessels is sometimes the cause of notable loss of heat after severe injuries of the upper portion of the spine. In sclerema neonatorum Dr. Bäumler* has observed a temperature as low as 71.6° F. (22° C.).

**Cold** may be defined as a lower degree of temperature than that which is normal to the human body. Absolute cold would be a condition entirely free from sensible heat; it is estimated at several hundred degrees (—459 degrees) below zero. Cold is, therefore, unknown to us, practically, and by the term we mean simply lower degrees of heat. Articles which, when applied to the surface, abstract more or less heat from it, are said to be cold; those which, on the contrary, communicate heat to the body, are said to be hot.

This fact is of considerable service in therapeutics, since we are able, to a certain extent, to regulate the bodily temperature by means of external applications. For convenience we will treat of them under two heads, viz.: (1) the effects of hot applications or external heat, and (2) the effects of abstraction of heat by cold applications.

## I. Heat as a Remedy.

**Physiological Effects of Hot Applications.**—The primary effect of heat, when locally applied to the human body, is that of an excitant or stimulant. If the temperature be sufficiently high,—say, that of boiling water,—irritation will be so great as to lead to serous effusion between the layers of the epidermis, the external squamous layer being thereby elevated and a blister formed, followed by more or less local inflammation. If the temperature be even greater, necrosis of the tissues will take place, to a greater or less extent, followed by sloughing. The application of higher degrees of heat, as by the actual cautery, is attended by shriveling and combustion of soft parts, followed by decomposition, suppuration, and necrosis. More or less pain is caused by the application of anything to the surface the temperature of which is much higher than that of the body. After the application of heat, the electrical currents in the sensory nerves are reduced, or even destroyed. Heat may, therefore, act as a sedative in painful affections of the nerves. Moderate heat, applied generally to the surface, produces important physiological effects, which have already been referred to in discussing the effects of warm and hot baths. Dry heat is better borne than moist heat, and glass-workers, metal-founders, stockers, and others constantly carry on work at a temperature much greater than that of the human body. It is recorded of Chabert, "the Fire King," that he frequently exposed himself to a temperature of 400° to 600° F. without injury; and, in the Turkish bath, the temperature of the hot room is ordinarily from 140° to 160° F.

The effects of exposure to an elevated temperature in dry hot air, for a short time,—from half an hour to an hour,—are: a slight rise in bodily temperature and an increased rate both of pulse and respiration, but more of the former than of the latter. The capillary system becomes congested, and the arterial tension is increased as a result of greater rapidity of the heart's action. The action of the kidneys and skin is more marked, and the proportions of chlorides and urea are increased. The skin becomes bathed in perspiration, which, by its evaporation, keeps the bodily temperature down nearly to normal. In moist air this evaporation does not so readily take place, and much lower degrees of heat speedily become unsupportable. It is on days when the humidity is great that sun-stroke is more apt to happen, since, under such circumstances, the bodily temperature rises until the brain is affected by the overheated blood, and coma or convulsions occur. This is more likely to occur if the person affected has been engaged in active muscular effort at the time of exposure.

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* "Quain's Dictionary of Medicine," p. 1599.

**Therapeutical Applications of Heat.**—General or local measures may be employed to exert thermic influences upon the body. The general applications may be made by means of baths of various kinds, including the Russian or steam bath, and the hot-air bath, which have been already referred to. A variety of the latter is known as **heliosis**, or the sun-bath, which has a powerful effect upon nutrition, and in some chronic forms of disease it has curative effects scarcely obtainable in any other manner. It may be taken in a warm room, with the clothing removed from the portion of the body to be acted upon, or the entire body may be exposed to the rays of the sun for a period of half an hour to an hour; or the body may be covered with clothing, and the warmth of the sun principally utililized. That the sun's rays exert a powerful influence is shown by the acute dermatitis which is caused by exposure to the sun while boating or swimming; even blistering is produced, in severe cases, besides discolorations of the skin (tanning and freckles). The direct rays of the sun, concentrated by a double-convex lens, have all the effects of the actual cautery, and may be thus employed to destroy epithelioma, or small growths in the skin.

Local applications of heat may be made by means of hot-water bags, sand-bags, bricks, etc.,* or by cataplasms, fomentations, or local baths.

Bœckel has shown that the virulence of chancroid is destroyed by a temperature from 40°–42° C. (104°–107.6° F.). In accordance with this observation Welander has made use of heat with excellent and rapid effect in cases of chancroids and buboes. The heat was appled by means of leaden coils connected at one end with a reservoir of water at a temperature of 50° to 52° C. (122°–125.6° F.) and at the other with a waste vessel beneath the bed. The pipes are bent to correspond to the form and locality of the ulcer and are covered with a layer of moist cotton before application. In passing through the tubes the temperature of the water is reduced to 40°–42° C.

The general application of heat is useful where the body has become chilled, or there is collapse, owing to loss of blood, or shock after an injury; also in alcoholic intoxication. The patient may be covered with blankets, brought close around the neck, but lifted up from the body into a sort of a low tent, into which hot air may be carried from an alcohol-lamp or small baskets, containing hot bricks or sad-irons, may be ranged by the side of the patient. Circulation of the blood may be assisted by rubbing the patient's limbs toward the trunk. The hot bath has already been considered. Baths of hot sand and mud-baths are used in Europe for the cure of rheumatism, paralysis, and spasmodic contractures of muscles. In collapse of cholera and in restoring persons apparently drowned, heat is of great importance. Topical applications of heat are called for in cases of pain, local congestions, or spasms, and to allay irritability by acting as a counter-irritant. Thus, in neuralgia or toothache, the application of heat with a rubber bag, or with the hop-bag moistened with hot whisky, is often of signal service. In a similar manner, colic of various kinds—colalgia, gall-stone colic, nephritic colic—is promptly relieved by hot applications, either dry or moist. In pneumonia and pleurisy, hot poultices relieve pain and congestion, favor perspiration, and moderate the fever, and cough. Hot applications will often arrest superficial inflammation if applied early, and in later stages they favor suppuration and separation of the necrosed tissues from the living. A hot-water bag applied to the spine, in the dorsal region, will stimulate the spinal centres and check uterine hæmorrhage. In rheumatic inflammation of joints, subacute in character, the alternate application of hot and cold applications causes rapid absorption of the effusion. The many uses of poultices and the hot-water bag cannot even be enumerated here, but enough has been mentioned to indicate their therapeutic value. By combination of mustard or spices with a cataplasm or poultice, the counter-irritant effect is greatly increased; but this is beyond the borders of the subject of heat by itself, which is now under discussion. The higher degrees of heat are used as escharotics.

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* Professor Tarnier has used warmth with remarkable results, in saving the lives of prematurely born or weak infants. He uses a box heated with hot-water bottles, the heat being regulated with the thermometer. This apparatus is called a *couveuse*, and is in general use in maternities and foundling asylums.

The Chinese method of raising a blister is to immerse a plate of metal, of the required size, in boiling water. When thoroughly heated, it is taken out and applied directly to the skin. As this is very painful, it is not to be compared with the ordinary method, and is not likely to come into favor here with the profession or public. The actual cautery is a surgical instrument, but it may be utilized in medicine in the treatment of chronic rheumatic or tubercular inflammation of joints. In sciatica the surface over the course of the nerve may be lightly touched by the actual cautery, to produce a counter-irritant effect, or a piece of flannel overlaid by hardware paper may be placed along the limb over the painful area and a hot sad-iron passed lightly over the surface.

## II. EFFECTS OF ABSTRACTION OF HEAT BY COLD APPLICATIONS.

**Physiological Effects of Cold.**—Cold applied to the living body produces some congestion of the superficial blood-vessels, soon followed by their rapid and extreme contraction and lowering of the surface temperature. If the exposure has been moderate, reaction follows, with redilatation of the capillaries, augmented energy of the circulation, and restoration of the normal heat. In weak or debilitated people, reaction is slow, or may not appear at all; but there is a more or less lengthy period of vital depression, accompanied by enfeebled nutrition, and followed by a slow recovery. Prolonged exposure to a low temperature may induce not only local and temporary vascular syncope, but local or even general devitalization; beyond this point only the physical and chemical effects of cold continue. Complete freezing of a tissue or organ is never followed by complete restoration of function, as the devitalized portion is necrosed and sloughs off. This condition is known as frost-bite and gangrene. Less intense cold may lead to a tendency to permanent dilatation of the capillaries of the skin, associated with paræsthesia and at times pruritus. This is known as **pernio,** or chilblain, and causes much annoyance to children especially. The application of carbolized lotions or petrolatum with carbolic acid (3 to 5 per cent.) affords much relief. Frost-bite may lead to loss of toes or fingers, or even require amputation of portions of the feet, after severe exposure. Death from exposure to cold is attended by shriveling and lividity of the skin, muscular weakness and rigidity, with mental symptoms, drowsiness, confusion, and coma. These symptoms have been mistaken for the effects of alcohol, and the error is more likely if the subject had been indulging in alcohol before his exposure. The **post-mortem appearances** consist in a waxy anæmia of the surface, varied by bright-red patches on the more exposed portions of the body. Internal organs much congested. The reddish-brown stains along the course of the superficial blood-vessels are due to disintegration of the blood-cells by the cold and diffusion of the coloring matter through the vascular walls (C. E. Shelly*).

In treating a patient who has been rendered unconscious by extreme cold, the point to be borne in mind is that the restoration of heat should not be rapid, but gradual. The patient should be stripped of clothing and put between blankets, in a cold room; the surface should be stimulated by gentle friction, using snow or ice-water to frozen parts, at first, and afterward dry flannel. The bladder should be emptied by catheter, and small quantities of hot broth, tea, coffee, or beef-tea may be administered as soon as the patient can swallow. After reaction is established, but not at first, some hot toddy may be given. Nutritive enemata may be administered, and the patient carefully nursed, as recovery is usually slow.

**Therapeutics of Cold.**—Two classes of cases are benefited by the application of dressings, or other agents, of low temperature. These are: where it is desired to have the primary and secondary physiological effects upon nerves, blood-vessels, and cells of the part, and secondly, where the physical effect is principally sought after through the abstraction of heat or the lowering of abnormal temperature. With regard to the latter, it may be said that nervous symptoms of various kinds are produced by an abnormal temperature of the blood as it flows through the vessels of the brain, and in what Dr. H. C. Wood terms "thermic fever" the principal object of treatment is to protect the brain centres by abstraction of heat from the blood. In the treatment of pyrexia, cold is used as an antipyretic by numerous methods,—the cold bath, wet pack, sponging of the surface, or by the water-bed or coils of rubber tubing. Cold-water enemata in typhoid fever have some influence upon the temperature, and tend to make the patient more comfortable.

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* "Dictionary of Practical Medicine." Edited by J. K. Fowler, 1890.

Cold is not only **antipyretic**, but may be applied as a **tonic** and **stimulant**, reaction being hastened by brisk friction. It also acts as a sedative and anodyne by abstraction of heat and lessening the conductivity of nerve-trunks; it may even be a local **anæsthetic**; but care should be taken not to freeze the part to which it is applied. When properly used in this way, it is sufficient to prevent the feeling of pain during small operations, and is frequently resorted to. It is also an **anaphrodisiac** when locally applied, or a shower of cold water is sent along the spine. It is **antispasmodic**, as when a child with convulsions or spasm of the glottis is relieved by pouring several pitcherfuls of cold water over the head and neck. The cold douche is a powerful respiratory excitant in cases of narcotic poisoning and in asphyxiated infants. In chorea, cold applied to the spine, either by the douche or by ether spray, has produced satisfactory results, and a similar application may be made in hysteria. In hysterical catalepsy, hysteria major, convulsions, etc., the sudden pouring of a bucketful of cold water upon the face and mouth, from an elevation of three or four feet, frequently has a marvelous effect. A similar douche of cold water from a pitcher is useful when poured upon the abdomen in cases of inertia of the uterus, either before or after childbirth. In suppression of urine, a cold douche to the dorsal region of the spine often causes free secretion of urine. Contraction of the bladder may be induced in the same way.

The anodyne effects of cold are utilized in the treatment of inflammation, contusions, etc. Sprains, as a rule, are best treated with a local bath of very hot water, followed by compression. Should pain follow, the dressings may be wet with ice-water. This is also useful if there is pain after fracture. In acute inflammation of joints the ice-bag is of great service in checking inflammation. Compresses of flannel wet with ice-water, are useful in tonsillitis, pharyngitis, and laryngitis. Dr. O'Hara, of Philadelphia, reported a case where the continuous resort to cold applications to the throat in a case of diphtheria averted the supposed necessity of a resort to tracheotomy.*

Dry cold is used by means of an ice-bag or bladder filled with broken ice. The skin should be protected by means of one or two layers of flannel, or local freezing (frost-bite) may be produced. This method is very useful in meningitis, and even a congestive headache. The ice-bag should be partly suspended by a cord so as to take its weight from the head. This also has some effect upon the general temperature. The method has also been utilized in cases of fracture, in vertebral caries, in orchitis, or epididymitis, and in numerous other conditions where it has proved exceedingly valuable. Dr. John A. Miller has used ice with excellent results in phlegmasia alba dolens. A large towel was dipped in ice-water, wrung out and wrapped around the affected limb, after which a heavy flannel roller-bandage was applied from the toe to the groin. Over the most painful parts were placed rubber bags filled with ice and kept in position by an additional bandage. Pain was markedly relieved by this practice and the temperature was speedily reduced. From the application of ice over the cardiac region M. Jullien has derived great benefit in grave ataxic forms of typhoid fever, in which death seemed imminent. The result was reduced frequency and increased strength of the pulse, together with reduction of temperature and disappearance of the cerebral symptoms. The application should be watched carefully, as to its results, but there appears to be no danger in prolonging it, while the general condition remains dangerous. In pericarditis, whether dependent or not upon rheumatism, Dr. D. B. Lees, of London, made use of a similar method with satisfactory results. He was led to its use in this disease by his experience with it in the treatment of pneumonia Dr. Lees concludes that the ice-bag when used with caution is a safe application in pericarditis, that it is usually liked by the patient, tends to check the violence of the local inflammation and to restrict effusion. The application even seemed to assist in the absorption of fluid, which was already present*; Dr. Angus McGillivray, of Dundee, states that the treatment of ocular wounds by means of the continuous application of iced compresses has given him great satisfaction.

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* Transactions of the Philadelphia County Medical Society.

Care should be taken in applying cold to weak or elderly people, and in those with a marked valvular lesion of the heart; for in all these cases reaction, if it occur, will be slow, and it might lead to catarrhal attacks. The cold douche must not be used in fever if there be extreme weakness and feeble pulse, with delirium and cool, clammy skin.

Evaporating lotions, used in treatment of contusions and inflammations around joints, are merely a method of obtaining refrigeration or cold; but as they commonly involve the use of various medicaments other than cold, they need not be considered here.

Small pieces of ice, allowed to melt in the mouth, allay irritation in cases of sore throat and thirst in cases of fever.

## LIGHT AND DARKNESS.

Light and darkness are relative terms. Just as cold is merely the absence of heat, so darkness consists in the privation of light. Like heat, also, it is a form of energy, and is regarded essentially as a mode of molecular motion. Modern physics recognizes, in fact, a very intimate relation between light and heat. In the rays of the sun and those emanating from an ordinary incandescent or luminous object, such as a lamp or fire, light and heat are always associated. The rays of light are less diffusive than heat-rays, and the latter may be separated by passing through a saturated solution of alum, which absorbs the heat-rays, but permits the light to pass. In what is termed phosphorescence in insects and luminous bacteria, the heat rays are deficient. In addition to light and heat, the rays of the sun contain energy, in a form of peculiar activity. These obscure rays, which, in the solar spectrum, are found in and just beyond the violet, are known as the **actinic** rays. As it has been found that the actinic rays produce very marked chemical and photographic effects, it is very probable that part of the physiological and therapeutical effect of the sun's rays on the human organism may be ascribed to this source. The effect of sunlight upon the nervous system is sometimes excessive and injurious. In the West Indies, for instance, sun-stroke is much more to be dreaded than in more temperate countries, as it frequently sets up myelitis, neuritis, or some degenerative process in the body, which results in paralysis, insanity, or chronic invalidism. Even in our northern cities, meningitis is often caused by the sun's rays. From this we conclude that sun-stroke, or insolation, is something more serious than thermic fever, or a temporary overheating of the blood, the effects of which, by the way, are more marked in the lower animals than in man.

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* *British Medical Journal*, February 18, 1893, p. 344.

**Physiological Effects of Light.**—The tissues of the body are ordinarily opaque; but, with a high degree of illumination, such as may be obtained from the electric arc light, there is found a considerable amount of translucency. This is the basis of Voltolini's method of examination of the larynx by trans-illumination. We may also introduce electrical lamps into the stomach, partially distended with water, in order to examine the extent and amount of translucency of the stomach and abdominal walls. Under ordinary circumstances, it is probable that sunlight, at least, to some degree, actually penetrates the skin and enters the soft tissues, stimulating and vivifying the cells by its warmth and actinic influence. That it does exert some very important effect upon nutrition is demonstrated by the fact that persons who pursue occupations that keep them constantly in the shade, and away from the sun, acquire a peculiar pallor, and become anæmic. Moreover, not only are human beings dependent upon light for health, but the lower animals depend upon it for their existence. The Mammoth Cave of Kentucky has very few species of the higher orders of animal life, and these show evidences of defective development and imperfections of structure. It is a well-known fact that plants need light, in order that the cells may properly elaborate chlorophyll. Since the color of chlorophyll is due to a soluble salt of iron analagous to hæmatin, which is the chalybeate compound to which the red blood-cell owes its color, the paleness of plants grown in darkness is strictly analogous to the paleness of mill operatives and weavers, whose occupations keep them from exposure to sunlight. Light is not only necessary to physical health, but also for the moral nature. Darkness is depressing to the spirits and unfavorable to intellectual development. The punishment of the dark cell has been abolished almost entirely from penal and reformatory institutions, on account of its unfavorable influences upon the mind and the tendency to cause insanity which has been observed where it has been practised. There can be no question that the superior intelligence and quickness of comprehension of the human race, among the highly-favored nations, is due, in great part, to their success in providing artificial illumination for all classes of society,—literally turning night into day.

It has been experimentally demonstrated that sunlight inhibits or retards the growth of pathogenetic microbes. Tubercle bacilli will not grow upon culture media in direct sunlight, and even ordinary daylight is fatal to them within a period varying from a few minutes to several days. Diffused daylight exerts an adverse influence upon the Klebs-Lœffler bacillus, or organism of diphtheria. Janowski observed that the growth of the typhoid bacillus was checked by the diffuse light of a cold winter's day, and that direct sunlight destroyed the microbe in the course of several hours. As a result of experiments he concluded that these effects depended upon the chemical rays. Strong sunlight is injurious or fatal to anthrax spores. It has been shown that electric light likewise has a similar action which, according to Professor Marshall Ward, is direct upon the spores and not due to a chemical alteration in the culture medium as had been supposed by some writers.

**Therapeutical Deductions.**—As the absence of light favors anæmia and consequent lowering of vital tone from defective nutrition of the great centres, it is obvious that where this cause is operative it should be recognized and corrected in the treatment of **chlorosis**, **scrofula**, **scorbutus**, **consumption**, **debility**, **dyspepsia**, **neuralgia**, and a host of other disorders of impaired nutrition. **Neurasthenia**, when unattended by latent organic affection, should be treated by sun-baths, gentle massage, life in the open air, and easily-assimilated nutritious food. In weakly children, this course is followed by very satisfactory results, and a tendency to **marasmus**, **scrofula**, and **anæmia** may be thus overcome. **Anhæmatosis** is corrected by the actinic effects of the sun's rays, and the early stage of progressive anæmia may be amenable to this form of treatment in conjunction with proper diet and appropriate remedies.

In the treatment of the sick, a light, cheerful room is of great assistance to recovery. Especially should an invalid have a room into which the sunlight may enter. The eruptions of the **exanthemata** are made easier by light and heat, and the course of the disease favored. Where it is not desired to have an eruption, the part of the body may be covered with a piece of muslin, or an ointment which is impervious to light. Thus, in **small-pox**, pitting of the face may be prevented by having the patient wear a mask of linen, or by covering the surface with mercurial ointment. In some cases of **acute mania**, or **delirium**, it is advisable to have the sick-room partially darkened, and in **hysterical neuroses** it is sometimes observed that the patients are extremely sensitive to sunlight. On the contrary, persons suffering with **melancholia** and **hypochondriasis** are benefited by light and attractive surroundings. The low spirits of **dyspepsia** are dissipated by a daily walk in the open air, while regular, systematic out-door exercise is of great benefit to the patient in strengthening the digestive functions and enabling him to "outlive his dyspepsia."

## MUSIC.

Music belongs pre-eminently to the domain of psychological medicine. It is, therefore, appreciated to a greater degree by the neurologist and alienist than by the general practitioner. Man is something more than a definite combination of chemical compounds, and even more than a mere rational being; he is a moral and emotional individual, and this particular portion of his organization is the most innate and personal part of his nature as revealed to him by self-consciousness. When a man's feelings are touched he is aware that he is profoundly moved, and that, whatever it may be in this structure which is affected, it lies deeper than his reasoning powers or his physical frame. When a man's sympathies are excited he is impelled to a certain course of action by a more powerful force than that which he recognizes as emanating from his reasoning powers, or from what are ordinarily considered as the imperious demands of his bodily appetites. Happiness and misery, affection and aversion, love and hate find no place in natural philosophy or science, but they are powerful factors in human life, and in determining its issues for good or evil. Man is so constructed that his reasoning powers and emotions cannot be separated, nor can we think of these apart from their embodiment in a corporeal frame by which they are brought into material relationship and communication with the world. This being the case, the complete nature of man must come within the domain of medical science, which, indeed, finds expression in the old aphorism, "*mens sana in corpore sano*," health of the body not being complete without there is also mental health.

**Physiological Effects.**—Music, in addition to its influence upon the emotions has a decided influence upon the body. M. J. Rambosson read a paper before the Académie des Sciences, Morales, et Politiques (July 18, 1877) entitled "The Influence of Music on the Physical and Moral Nature of Man." In this essay, he affirmed that there is (1) music which acts specially on the intelligence and the motor nerves; (2) that which acts specially upon the nerves of sensibility and on the sentiments; (3) that which acts simultaneously upon the motor nerves and on the sensory,—that is, on the intelligence and the sentiments. From experiments made by Dogiel upon men and the lower animals, the following deductions are drawn: (1) Music exhibits an influence upon the circulation of the blood. (2) The blood-pressure sometimes rises, sometimes falls. These variations in blood-pressure depend essentially on the influence of the excitation of the auditory nerve on the medulla oblongata, which is apparently in direct continuation with the auditory nerve. (3) The action of musical tones and pipes on animals and men expresses itself, for the most part, by increased frequency of the cardiac contractions, and hence it follows that the automatic centres of the heart act with greater energy. (4) The variations in the circulation, consequent on musical sounds, coincide with changes in the respiration. though they may also be observed quite independently of the respiration (5) The variations in the blood-pressure are dependent upon the pitch and loudness of the sound and tone-color. (6) In these variations of the blood-pressure, the idiosyncrasies of the individuals, whether man or the lower animals, are plainly apparent; and even the nationality, in the case of, man, has some effect.*

Dr. Herbert Lilly, in the year 1880, wrote a pamphlet on the "Therapeutics of Music," in which he claimed that music directly influences the brain, in some individuals more than others, women being more readily affected than men. "Its effects are transmitted by a reflex action, through nerve media, to the sympathetic system governing the vascular supply. The vessels are made to dilate by stimulation of the vaso-inhibitory nerves or paralysis of the vaso-motor nerves, and so the blood flows freely and imparts that sense of warmth which is felt by us by reason of the local hyperæmia thus produced. By blood-supply is nutrition effected." The important influence upon the bodily functions of the imagination has already been referred to on a previous page. This, also, is under the influence, to a greater or less extent, of music.

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* Letter to *British Medical Journal*, by Frederick K. Harford, of the St. Cecilia Guild, November 14, 1891.

The ancient habit of introducing music at banquets is based upon the well-attested fact that digestion is favored if the mind be pleasantly entertained during the time of eating. On the contrary, unpleasant thoughts or violent emotions will take away appetite and retard digestion. Children are usually fond of music, and their uninstructed attempts at dancing show the stimulating effects which it exerts on mind and body. In the adult life, when the musical taste is more cultivated, the feelings may be swayed by music "from grave to gay, from lively to severe." The sense of pleasure and elation of spirits from inspiring military music has been experienced by most of us; but when to these are added the charms of association as familiar airs are heard, the influence is deeper and more affecting. As an illustration, we may mention the effect produced by the unexpected hearing of patriotic airs when in a foreign land. Music may be instrumental or vocal, or both combined, "words to music fitly joined." Vocal music has in it a personal element far greater than instrumental, and the mother's songs to her fretful infant contain a subtle influence to soothe and comfort the child. In the same manner it is observed that in hospitals singing is very grateful, especially to those whose troubled minds increase their restlessness and physical suffering. Music diverts the mind from bodily pain and leads it into more pleasant channels.

**Therapeutic Applications.**—In dentistry, a pleasant application of music is that in which, during the administration of the anæsthetic gas, a music-box is made to play lively airs. This directs the patient's thoughts into an agreeable direction, and no apprehension beforehand is felt, nor is there any recollection of the tooth-pulling afterward, the patient on recovery being ready to affirm that he had been at the opera or a ball. A further use might well be made of this in practical surgery. In nervous hypochondriacs, people who are morbidly anxious about themselves, it is more proper to recommend the opera on one or two nights weekly—even opera-bouffe, if grand opera be not appreciated—than it is to prescribe ammoniated tincture of valerian, coca, or damiana. For depression of spirits or a tendency to melancholia, lively music, such as a concert by a military band, for those who enjoy it, and vocalization of tender or pathetic ballads for those of more sensitive nerves, are resources within the province of the skilled physician, who knows how to "minister to a mind diseased" and "throw physic to the dogs."

A notable example of the influence of harmony in melancholia came within the personal experience of the author. Having charge upon one occasion of a gentleman afflicted with melancholia, the capitals of Europe were visited in search of every advantage of travel and recreation but nothing touched the settled gloom of the patient until, in Vienna, we resorted to the grand opera. While listening mechanically to dulcet symphonies intertwined with the mellifluous notes of enrapturing cadenzas, following each other in rapid succession and harmonic progression, there appeared in the patient's face and demeanor the first manifestation of interest which had been noticeable for months. Subsequent visits not only confirmed the opinion first entertained but continued and augmented the impression thus produced until within a few weeks we had the satisfaction of witnessing a complete recovery. The chronic dyspeptic is very apt to be sad, morose, irritable or hypochondriacal; such should be encouraged to resort to the concert and opera for entertainment and improvement. Those who have become weary from continued pursuit of an engrossing intellectual occupation may be most happily refreshed through the intrumentality of music.

In his famous "Anatomy of Melancholy," Burton gives an elaborate account of the medical qualities of music, telling us that "besides that excellent power it hath to expel many other diseases, it is a sovereign cure against despair and melancholy; will drive away the devil himself." Jaques Bonnet, in his "Histoire de la Musique et de ses Effets," tells how on one occasion he was entertained by a friend—then in the service of the Prince of Orange—with the performance of three first-rate musicians. This was the remedy, he informed him, which his master employed to get rid of melancholy whenever therewith oppressed.*

In the case of many nervous children, it is a measure of the highest utility to give them a musical training as an outlet for their excitability and as a means of soothing perturbed consciousness. In case there is a tendency to narrow chest and insufficient vital capacity, the respiration may be made more full by having the patients learn to perform on wind instruments.

In Paris, musical performances are resorted to, with marked advantage, in hospitals, and some investigations have been undertaken, in order to determine the influence of different kinds of music, especially in nervous cases. A St. Cecilia Guild has been formed in England, by Canon Harford. The objects, as set forth in the prospectus, are:—

"1. To test by trials, in a large number of cases of illness, the power of soft music to induce calmness of mind, to alleviate pain, and to cause sleep.

"2. To provide a large number of musicians, specially trained to sing and play the very soft music which alone should be administered to those whose nerves are weakened by illness. These musicians should be in readiness to answer promptly the summons of a physician.

"3. To hire or build, in a central part of London, a large hall, in which music shall be given throughout all hours of the day and night, this music to be conveyed by telephone attached to certain wards in each of the chief London hospitals.

"4. To obtain opinions and advice respecting the class of illness in which music is likely to be most beneficial, and to collect and record all reliable accounts respecting permanent benefit that has followed the use of music."

The work of sending musicians to hospitals and infirmaries has already commenced, and it is intended to continue the experiment long enough for a definite conclusion to be arrived at as to the services which music is likely to render to the sick. The scheme is said to have the warm approval of Miss Florence Nightingale and Sir Richard Quain and other eminent physicians.*

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* London Letter to *Medical Progress*, January, 1892, p. 607.

Professor Tarchanow, of St. Petersburg, in a recent lecture, takes the position that "music is of the greatest service in medicine," and that, by the proper use of it, the system can be tuned like a musical instrument. Sufferers from nerve disorders, especially epileptics, can, he states, be soothed by music, but the remedy must be employed with discretion. He attributes the frequent failure of music to its being used at the wrong time, or in unsuitable cases. He expresses the conviction that a time will come when music, "in the hands of scientifically-trained physicians," will be acknowledged to be an agent of great power for the relief of suffering. That it will relieve insomnia and ease pain, not by any analgesic action on the nerve-centres, but by distracting the sufferer's attention, will be admitted. The *British Medical Journal*, in commenting upon this, observes, editorially: "Here, we conceive, is the true field for music as a therapeutic agency, and it seems to us highly improbable that it can ever do more. . . . Within the limits which have been indicated, however, music may be a most useful handmaiden to medicine; and in this age of 'nerves,' it might possibly be made to play an important part in the prevention of the many diseases which are fostered, if not actually engendered, by depression and fatigue."† Dr. Lilley, in the paper previously mentioned, states that there are two principal classes of cases in which music might prove a useful remedy: (1) Melancholic and depressed patients, dyspeptics, hypochondriacs, liver cases, parturient women, men suffering from business reverses or family affliction,—these require the tonic form of treatment. (2) Irritable, nervous patients; alcoholic subjects threatened with delirium tremens, overworked business men, persons suffering with hysteria or the mania of pubescence, pregnancy, parturition, the climacteric and chronic insanity, and such like,—these require music of a soothing character. The music itself must be well chosen, well executed, and scrupulously considered in relation to individual natures; otherwise, it is of no value therapeutically. In order to be effectual, it must be of the best quality, and devoid of impurities; it must be administered at regular intervals, and in suitable doses.

It should be observed that, in this country, weekly concerts and the frequent use of musical instruments constitute a part of the course of treatment pursued in all the asylums for the insane and feeble-minded patients, and the influence has been found to be favorable to recovery. Cases which are excited by the music that the others enjoy are kept away from the concerts, although they might be soothed by soft music.

The invention of the phonograph by Edison has greatly simplified the matter of giving music in regular doses and of the proper quality and variety. The use of sounds in Charcot's clinic, in order to produce high-note effects, has already been mentioned under "Hypnotism."

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* Editorial Annotation, *British Medical Journal*, September 12, 1891.

† *Loc. cit.*, May 7, 1892.

# VARIOUS THERAPEUTIC METHODS MORE OR LESS MECHANICAL AND LOCAL IN THEIR EFFECTS.

**Acupuncture.**—The practice of inserting needles into the living tissues for the relief of pain or other disorder occupies a prominent place in Chinese medicine, and in some instances it is followed by strikingly beneficial effects.

The physiological effects of acupuncture are due principally to the reaction of the part against the traumatism; in other words, there is established a focus in which there is a dilatation and rupture of small vessels, hyperæmia, afflux of leucocytes, and increased nutritive energy due to stimulation of vaso-motor and sensory nerves. This is accompanied by slight swelling, moderate increase of local temperature, and tenderness upon pressure. The passage of the needles through dense tissues also favors the escape or diffusion of incarcerated local effusions in the sheath of a nerve or around a joint. It is not impossible that the insertion of a metallic substance into the tissues may produce some alteration in the electrical currents between the muscles, blood, and nerve-plates, and so interfere with the conduction of painful, afferent impulses along the sensory nerves.

Acupuncture is rarely resorted to at present, except in the modified form of the hollow needle connected with the hypodermic syringe, which has been already mentioned under methods of administering remedies. The hypodermic needle, indeed, is a very convenient agent for making acupuncture. Care should be taken that the needle is always perfectly aseptic. In **sciatica** a needle may be made to transfix the nerve as it passes over the bone at its exit through the sciatic foramen, or the point where pain and tenderness are most marked may be selected for the operation. In **lumbago** the introduction of needles into the affected muscles often affords marked relief in a few moments. This is more successful when the pain is bilateral than when only one side is affected, according to Ringer. Should the patient shrink from the punctures, the spot may be made insensitive by the local application of ice and salt or by sprays of rhigolene or ether. Injections, under the skin or into the deeper structures, of morphine, atropine, cocaine, antipyrin, chloroform, or simply distilled water (aquapuncture) are often combined with acupuncture for the relief of neuralgia. In acute rheumatic affections acupuncture is useless unless in the combined form just mentioned.

In dropsy of the extremities, scrotum, etc., multiple acupuncture may be performed in order to relieve tension and encourage oozing. If the punctures are made with hollow needles they may be allowed to remain in place, as suggested by Spender, or fine perforated trocars, with drainage-tubes attached, may be used for the same purpose. Simple punctures close again very promptly, and we therefore must resort either to drainage tubes or incisions. Exploring needles are convenient for making acupuncture, and useful in establishing a diagnosis. Baunscheidtism is multiple acupuncture, combined with counter-irritation. It will be discussed a few pages farther on.

The combination of electricity with acupuncture (electro-puncture) suggests itself, and has been already considered under "Electricity." The difficulty with it is that, except for the electrolysis of surplus hair and for small growths in the skin, it is too painful. The electrodes are so small that the current is under too high a tension just around the poles. Macewen, of Dublin, recommends acupuncture in the treatment of aneurism of large arteries like the carotid or subclavian. A long steel needle is introduced into the interior of the vessel, and the internal coat slightly roughened by scratching with the point; in this way favoring the production of a white clot and inducing the deposit of fibrin upon the interior of the aneurism, so as to thicken and strengthen its walls.

In the *Annals of Surgery* for January, 1891, Dr. Lewis S. Pilcher furnished an editorial review of Macewen's operation as described in an address delivered before the Midland Medical Society.* The operation in question was designed for the cure of aneurism by inducing the formation of white thrombi within the sac. This object is secured by irritation at different times of the interior surface of the aneurism, this being done by a pin of sufficient length to completely transfix the aneurism and to permit manipulation within it. Its calibre should be as fine as possible, the strength being only sufficient to penetrate the coat of the artery and the intervening tissues. It is cylindrical, tapers to a point like an ordinary sewing-needle, and has on the opposite end a somewhat rounded head; as the coats of aneurism vary in thickness, it is necessary for the pins to vary in calibre, since those which may pass readily through the walls of one sac may not penetrate the thicker walls of another. They should also be finely polished not only to facilitate their introduction, but to assist in rendering them aseptic. The object of the operation is to secure a white thrombus in an aneurismal sac, by irritating the wall of the aneurism in such a way as to induce infiltration of the parietes with leucocytes and a segregation of them from the blood-stream at the point of irritation. The irritation ought to be just sufficient to set up reparative exudation, and should not exceed it; if the irritation be pushed to such an extent as to induce softening of the vessel wall, not only would the object be frustrated, but the pressure of blood from within might cause the aneurism to burst. It is sought to have several foci of irritation, in order to obtain which the inner surface of the aneurism is lightly scratched by the pin, which may be introduced through the wall at a convenient location, and the point then moved around in the interior of the sac so as to accomplish the desired result in the manner indicated.

It is considered desirable to secure as many foci of irritation and thrombus formation as possible, in order that the resulting clot may be large enough to occlude the vessel. "The operation is preceded by careful cleansing and asepsis of the skin over the aneurism. The aseptic pin is then made to penetrate the sac and pass through its cavity until it comes in contact with the opposite side, and no farther. Then irritation may be effected, either by moving the pin over the surface of the inner wall or by allowing the impulse of the blood-current playing on the very thin pin to produce the same result.

"If the wall penetrated by the pin, on introduction, be dense, the former method will be preferable, as the force of the blood-current will produce so feeble an action on the thin pin as to be insufficient to move it to and fro, while it is firmly grasped by the dense wall. After acting thus for ten minutes at one part, the point of the pin, without being removed from the sac, ought to be shifted to another spot, and so on until the greater portion of the internal surface opposite to the point of entrance has been acted upon." In some cases several punctures will be necessary in order to reach a sufficiently large surface of the inner wall. While the pin is in the aneurism, the protruding portion is surrounded by a bit of aseptic gauze, dry or moistened with an aseptic solution. When it is withdrawn from the aneurism, the part is covered with a moist antiseptic dressing; for this purpose Dr. Macewen prefers a watery solution of carbolic acid, and he keeps this dressing in place for several days.*

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* *British Medical Journal*, November 15 and 22, 1890.

**Antiseptics** are agents which prevent the development and check the activity of septic organisms. Inasmuch as these morbific agents are likely to find entrance by traumatism or by being brought into contact with a raw surface, the means of counteracting them is of great surgical interest, but has less to do with medicine proper. As it has been found, however, that the presence of bacilli and other forms of micro-organisms in the air-passages or intestinal tract or in the blood or the tissues gives rise to various diseases, such as diphtheria, typhoid fever, dysentery, diarrhœa, the exanthemata, measles, scarlet fever, erysipelas, etc., it becomes of medical importance to discover means of opposing them and of rendering them inert or, at least, of so reducing their virulence that they may do the least amount of harm. The problem is to find antiseptic agents which shall not be toxic to the human body, or so slightly toxic as to be perfectly manageable. Among these are alcohol, alpha- and beta-naphthol, antifebrin (acetanilide), antipyrin, chlorates and chlorides, creosote, europhen, hydrogen dioxide, iodoform, iodol, kreolin, naphthalin, quinine and other salts of cinchona, soziodolates of potassium and sodium, resorcin, salicylic acid and its salts, zinc sulphocarbolate, etc. For external use, carbolic acid properly diluted (1 to 20 or 1 to 40) and bichloride of mercury (1 to 500 or 1 to 2000), potassium-permanganate solutions, soziodolate of mercury or of zinc (2 to 5 per cent.) are very efficient. Arsenic and chloride of zinc are powerful antiseptics, but are too poisonous in their action upon the human body to be used unless with extreme care. The use and application of the agents named will be found discussed under appropriate headings in other parts of this work.

**Aquapuncture** has already been incidentally mentioned under the head of "Acupuncture." It consists in the use of a hollow needle to penetrate the tissues and the injection of pure water, recently boiled and sterile. It has been found from experience that this is often an efficient substitute for morphine injections, and that, in patients who have been unable to sleep without their evening hypodermic injection of morphine, the substitution of water has been made without detection by the subject of the experiment, and that sleep followed as usual. This is largely owing to the mental effect, which is very important to obtain in cases of insomnia as an aid to sleep. There is, however, a local effect of the puncture and injection of water into the tissues which is worthy of attention. In addition to the effects of acupuncture, which are not inconsiderable, there is a local tension caused by the fluid, which stimulates the absorbents to carry it away, and perhaps dissolves some morbific agent which causes pain or at least modifies the local chemical reaction.

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* From "Progress in Surgery in 1891;" being the annual oration before the Academy of Surgery of Philadelphia. By Thomas G. Morton, M.D. Reprint from *Times and Register* of Philadelphia, January 30, 1892.

Aquapuncture is used in the treatment of **neuralgia**, and, being entirely free from constitutional effects, it is better than morphine, antipyrin, and other agents commonly employed. There is no probability of the habit being formed, as with the use of these narcotic drugs ; and, even if it should be acquired, it will be harmless if care be taken to keep the needle and water perfectly aseptic.

**Aspiration.**—The pneumatic aspirator is an instrument invented by Dieulafoy for the removal of effusions or purulent collections by means of suction, or atmospheric pressure. The apparatus consists of a receiver, which, ordinarily, is a glass bottle of any desired capacity. Into this is inserted a cork having two perforations. Each perforation contains a metallic tube containing a stop-cock, and attached at the free extremity to a rubber tube. Finally, one rubber tube is armed with an aspirating needle, or trocar, and cannula; the other tube is attached to a small pump or exhaust-syringe. Now, the stop-cock attached to the needle being closed and the other one open, the syringe may be worked so as to exhaust the air in the receiver, when the stop-cock is closed and the partial vacuum maintained. If the needle be now inserted into any collection of fluid, and the appropriate stop-cock opened, the fluid will flow into the receiver until the supply is exhausted or the vacuum has been filled. The process can now be repeated, and this is done until the desired quantity of fluid has been removed. It may be necessary to empty the receiver several times during the operation. The great advantage of this method is, that no contamination of the contents of the cavity by the air can take place; nor can air enter the wound of puncture, if it be promptly sealed with adhesive plaster. Several modifications of the apparatus are supplied. In one the syringe itself is made large enough to act as the exhaust chamber, and, by a double stop-cock, the fluid is drawn out by an upward movement of the piston, and by turning the cock it is discharged through a long rubber tube into a basin or other receptacle. Either form may be employed for injection by reversing the process, thus irrigating, or overdistending, the interior of an abscess, as practised by the late Mr. Callender.

The ordinary hypodermic needle and syringe may be employed for aspirating small cavities or for purposes of diagnosis.

Capillary aspiration may be performed by attaching a long rubber tube to a hypodermic needle and filling it with antiseptic solution, leaving the extremity of the rubber tube beneath the surface of some water in a basin. The hollow needle is now introduced, by a rotary motion, through the tissues directly into the cavity, and retained in place by adhesive plasters. The flow of the liquid is much slower in this case; but this is an advantage in some cases,—for instance, in effusion into the pleura.

One of the dangers of aspiration of the chest is: the sudden alteration of pressure upon the walls of the blood-vessels by the rapid removal of the fluid might lead to congestion and, possibly, œdema. When the apparatus is not rendered aseptic, there is danger of exciting suppuration and septicæmia. Sudden removal of pleural effusions has been followed by death within a few hours, apparently of shock.

Pneumatic aspiration is a useful expedient for removal of dropsical effusions into serous cavities, serous exudations, or purulent collections in any accessible locality. Hydrothorax, ascites, hydrocele, hydropericardium, effusions into the pleuræ, pericardial sac, into the cavities of joints, are all easily treated in this way. Purulent deposits, such as in psoas abscess, hip-joint disease, which do not admit of open incision on account of danger of septic infection, are properly emptied by aspiration. Over-distention of the gall-bladder or urinary bladder may require aspiration, and if properly performed the danger from peritonitis is inconsiderable. Large effusions of blood—hæmatocele, for instance—may be first injected with a pepsin solution to dissolve the fibrinous clot, and afterward exhausted with the aspirator. In pleural and pericardial serous effusions, it is sometimes an advantage to perform capillary aspiration, when immediate relief is not required. The contents of ovarian cysts may be determined by examination of a portion withdrawn by aspiration. Hammond advises the introduction of a long aspirator needle into the liver in nervous hypochondriacs, in order to determine whether or not the symptoms may be due to abscess of the liver.

**Bandaging.**—In medical practice the ordinary surgical roller bandages are employed to make uniform pressure, in order to promote absorption of effused material; to support inflamed or swollen parts, such as mammary gland or testicle; and to retain dressings, such as poultices or antiseptic appliances. Bandages may be made of any convenient dimensions, and are usually from two to three inches wide and from six to eight yards in length. They are ordinarily made from unbleached muslin free from sizing, but they also are made from thin white flannel, gauze, or crinoline. The flannel bandages not only may be applied to make pressure, but also are useful for their retention of warmth. In fact, in catarrhal inflammations of the throat, tonsillitis, laryngitis, etc., a flannel bandage around the neck is of considerable service. Inflamed rheumatic joints, either acute or chronic, are often materially relieved by a flannel bandage wound closely around the part. A flannel bandage from twelve to twenty-four inches wide, according to circumstances, worn around the waist, in infants, and even in older persons, is useful in preventing attacks of colic from exposure to cold.

In neuralgia accompanying neuritis, or in herpes zoster, a flannel bandage is an important part of the treatment. In acute pleurisy the application of a bandage around the chest prevents excursion of the ribs in coughing, and alleviates pain. It is sometimes useful to apply strips of adhesive plaster in the same way as in treating fracture of the ribs; this not only affords comfort, but keeps the effusion from becoming excessive in quantity. In chronic pleurisy the application of a bandage and the application of counter-irritants to the underlying surface considerably promote absorption. A bandage of narrow strips of adhesive plaster is applied to an enlarged testicle for the same purpose.

After delivery, the parturient woman is made comfortable by the application of a wide bandage extending from the hips well up on to the chest. This, in a measure, supplies pressure to the walls of the abdominal blood-vessels and prevents syncope. A bandage is sometimes applied during labor, previous to delivery, to support the uterus and abdominal walls.

Retentive bandages are required in various forms of hernia, also in varicocele and in varicose veins. When the ankles tend to swell, bandages are applied with much relief and decided effect upon the œdema. A tight bandage around the head sometimes relieves headaches. In cases of apoplexy, bandages may be wound around the thighs and arms in order to reduce arterial tension. When venesection is to be performed, a bandage is applied around the arm so as to cause the veins to become prominent. In cases of snake-bite, a narrow bandage should be thrown around the finger, or the limb, in order to prevent the introduction of the poison into the general circulation, except by degrees. In ordinary cases bandages should not be so close as to check the circulation in a limb, or gangrene may result. Retentive bandages are used to keep dressings and medicated compresses upon the surface of the body.

Brown-Séquard showed that the application of a tight bandage around the big toe would, in some cases, check or prevent an epileptic attack.

**Baunscheidtism.**—As already stated under the head of "Acupuncture," the procedure, named in honor of the German who invented the instrument employed in this manner of treatment, consists essentially in multiple punctures of the skin, into which some counter-irritant application is rubbed. The little instrument contains a spiral spring in a handle six or eight inches in length. At its inferior end the instrument is enlarged to form a circle from three to four centimetres (one to one and one-fourth inches) in diameter. In this crown are concealed eighteen or twenty needles, which are suddenly projected from a quarter to a half an inch, when the spring is pulled up and suddenly released. If applied to the skin a circle of minute punctures is made by this procedure. Now, if croton-oil, diluted with sweet-oil, be rubbed into these punctures, a decided inflammatory reaction is produced, affording considerable counter-irritant effect. This method is used principally for the treatment of chronic affections of joints attended with pains and more or less exudation. It also affords relief in myalgia, lumbago, and some forms of neuralgia.

**Blood-Letting and Transfusion.**—Blood-letting is not entirely a lost art in medicine, but our therapeutic resources have so greatly increased within the past twenty or thirty years that its usefulness has been very much restricted.

General blood-letting is usually performed by opening a vein,—venesection, phlebotomy,—and the one selected is usually the median cephalic or median basilic, although it may be performed from any large superficial vein, such as the temporal, external jugular, or the veins on the dorsum of the hand or foot. Arteriotomy is sometimes done in cerebral affections, by section of the temporal arteries. In persons known as hæmophiles, or bleeders, any cut or rupture involving a blood-vessel is likely to produce the effects of general blood-letting.

Although rarely resorted to at the present day, general blood-letting is a valuable therapeutic resource. It moderates high tension and vascular excitement, relieves congestion, allays nervous irritability and pain, relaxes the muscular system. It also moderates inflammatory action and promotes absorption, and before the days of arterial sedatives was pre-eminently the leading antiphlogistic remedy. The history of medicine contains many instances of desperate cases, where life was apparently saved by frequent resorts to the free use of the lancet.

The place that venesection occupies in therapeutics is an uncertain one. In a recent paper, Dr. Hiram Corson strongly advocates bleeding for the relief of pneumonic patients, and he thinks that, as there is always more or less attendant congestion, any time is the proper time to bleed. There are others, and these are the majority of clinical teachers, who advocate bleeding in pneumonia during the first stage, where there is a dilated right heart from obstruction in the pulmonary circulation. Finally, many others, of equally high authority, declare pneumonia to be a specific fever, incapable of being favorably influenced in its course or termination by abstraction of blood, which on the contrary, may do much harm. Under such circumstances the question of "to bleed or not to bleed" must be determined altogether by the circumstances attending the individual case. Bleeding is undoubtedly serviceable in eclampsia, during pregnancy or parturition, or immediately afterward, provided there is high arterial tension and there is congestion of the brain. In convulsions following exposure to the sun, bleeding is practised with benefit, but it is highly injurious or fatal in the ordinary form of sun-stroke. In narcotic poisoning and in uræmia, venesection is to be used with caution, but it is a justifiable resort in severe cases.

General blood-letting is of undoubted immediate service in some cases where there is overdistention of the heart and vessels in extreme pulmonary congestion. It is of value also in acute cerebral congestion accompanied by convulsions. In pulmonary emphysema an occasional bleeding will afford prompt temporary relief and spare the patient much suffering in his last days. Dr. G. Newton Pitt has recently described nine cases of thoracic aneurism with or without aortic incompetence, in which venesection had been followed by considerable relief to the acute symptoms, as pain, cough and dyspnœa.

In inflammations of strong, robust people, the judicious abstraction of blood makes the patient more comfortable and lowers arterial tension. In iritis, a good bleeding is remarkably beneficial at the outset of the attack.

In patients of large, muscular frame, when there has been a dislocation of a large joint, the abstraction of blood has been resorted to in order to produce complete muscular relaxation.

Blood-letting should be resorted to with caution in persons of feeble digestion and weak assimilative powers, and rarely, if ever, in elderly persons and very young children, in low fevers, in tubercular affections, and in persons disposed to hæmorrhage.

The local abstraction of blood is accomplished in a number of ways, the most common being scarifications, multiple punctures (the antiphlogistic touch of Prof. Wm. H. Pancoast), and by leeches and wet cups.

Scarifications are linear incisions, superficial, for the most part, cutting into the derma or through granulating tissue, for the relief of local engorgement, as in conjunctivitis, granular lids, etc., and tonsillitis. In œdema of the larynx, scarification is of great immediate relief; but in œdema of the scrotum or lower extremities it is objectionable because the incisions do not heal readily. Multiple punctures may be skillfully performed with a fine knife, or tenotome, and congested blood-vessels relieved of their tension. It is absolutely required that the knife shall be surgically clean and recently made aseptic, or serious results may be produced. A felon may be aborted by early punctures through the soft parts to the bone.

A **leech** (hirudo) is an aquatic worm of simple annulated structure found in different parts of the world. Its mouth is armed with cutting teeth, with which it makes an incision throught he skin and holds on by exerting a suction power; when it becomes filled with blood it drops off. It can be made to drop off earlier by application of salt water. The European or Swedish leech is about two inches in length, and will draw about half an ounce of blood. If the bleeding from the leech-bites be encouraged by warm fomentations, each leech can be estimated to cause the removal of one ounce of blood. The American leech is smaller, and will only take about one-fourth as much blood. If the discharge of blood from the leech-bites is more than is desired, it may be checked by touching them with a stick of nitrate of silver, a little Monsel's solution, or dry subsulphate of iron, by pressure, or by a small suture.

**Cups** may be **wet** or **dry**. The cup is a small, bell-shaped glass, which, at its upper extremity, has an opening guarded by a valve, so that, when applied to the surface, and the small syringe-pump employed to abstract the air, a partial vacuum will be formed and maintained in its interior. The soft tissues rise up into the cup and become deeply congested by dilatation of the blood-vessels. The spot may be scarified and the cup re-applied, so that when the airis exhausted, the blood will flow in to take its place. This is called wet-cupping, and it is a valuable resource for local abstraction of blood and a revulsive agent. When the proper apparatus is not to be had, cups may be extemporized by egg-glasses or coffee-cups, the edges of which are thick and not likely to cut the skin. The air can be exhausted by pouring a few drops of ether or alcohol into the glass and igniting it; while the vapor is burning the cup is inverted upon the skin and the flame is immediately extinguished. The cup, in cooling, causes contraction of the air, and the tissues are forced into the cavity by atmospheric pressure. A piece of burning paper may be used in the same manner, to exhaust the air from the cup.

Local blood-letting reduces local hyperæmia and swelling, and, consequently, relieves pain; it limits the destructive effects of inflammation and favors restoration to the normal condition.

Cups and leeches are useful as revulsive agents and for local depletion. The latter are useful for inflammation of glands and swollen joints. In inflammation of the eye they are often resorted to. Cups are used in pneumonia, pleurisy, and other affections of internal organs.

**Transfusion** is the process by which there is introduced, directly into the blood-vessels of a patient, either blood or blood deprived of fibrin, milk or various saline solutions. The transfusion of blood may be **immediate** or **mediate**; in using defibrinated blood or fluids other than blood, the process is always mediate. In the form known as immediate transfusion, the vein of the patient is practically made a continuation of the vein of the donor of the blood by means of a short rubber tube. The method usually followed is to obtain a small rubber tube, having glass or silver tubes at its ends, and with a bulb in its middle by which the blood can be urged forward on its course. It contains no valves; but when the bulb is compressed the operator must pinch the tube behind the bulb, and before the pressure is removed from the bulb the tube must be released and pinched in front of the bulb so that the suction shall be in the proper direction. This is known as the transfusion apparatus of Aveling. The method of using it is to obtain the assistance of a person who is in good condition and can spare from eight to twelve ounces of blood. The arms of both donor and receiver are properly prepared antiseptically. The median cephalic or basilic vein of each is then exposed by a short incision and the wall of the vein cut so that the cannula may be introduced, pointing toward the centre in the patient and toward the extremity in the donor. The little apparatus is filled with a warm saline solution so that no air will enter the vein, and is put in place and confined there with a bandage, if necessary. Now, by proceeding as indicated, alternately slowly compressing the bulb and again allowing it to expand, the saline solution passes into the vein and is followed by blood. The entire amount of blood may be estimated by counting the compressions of the bulb, it having been determined previously by experiment how much blood is delivered at each movement. The operation is concluded by bringing the edges of the vein together with a fine suture and closing the wound and applying a light compress of gauze with a roller bandage.

Mediate transfusion is a less simple procedure. The blood to be injected is drawn into a bowl and whipped with some twigs in order to remove fibrin and prevent clotting. The defibrinated blood, carefully maintained at a temperature of 100° F., is drawn into a warm syringe and slowly injected through an opening in a vein, as in the preceding method. The most complete antiseptic precautions are required.

Arterial transfusion is rarely performed, although perfectly feasible, as shown by laboratory experiments. The objection is that it involves permanent obliteration of an artery on the part of the donor. A superficial artery, such as the dorsalis pedis, is selected, and, after dissection from overlying tissues, it is divided and a silver cannula inserted, connecting with a rubber tube with its opposite extremity armed with another cannula, which is introduced into a vein of the recipient. The force of the arterial circulation will make the blood traverse the tube, which should be kept warm with hot towels wrung out of bichloride solution.

Milk used for intra-venous injection should be obtained directly from a healthy cow or goat, and poured into a funnel terminating in the tube and cannula as before. A strainer of fine gauze should be placed over the mouth of the funnel to intercept any accidental impurity or foreign body which might have fallen into the milk. Saline solutions may be introduced either in the same manner or with a syringe or aspirator. The following solution is recommended by Hayem as a sort of artificial blood-serum:—

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| Sodium hydrate, . . . . . . . . . | 15½ grains. |
| Sodium chloride, . . . . . . . . . | 80 grains. |
| Sodium sulphate, . . . . . . . . . | 390 grains. |
| Water, recently boiled and filtered, . . . . | 3 fluidounces. |

Of this from 1 to 4 pints may be slowly injected at a temperature of 100° F. It is important that, as recommended by Potain, the fluid be injected slowly, at a rate of less than an ounce (20 cubic centimetres) per second. The specific gravity of the solution should be about 1020.

**Transfusion of blood** has been practised for years as the rational method of saving life where death is at hand from hæmorrhage. In post-partum hæmorrhage, or loss of blood attending abortion, this method has proved successful in many instances, as this is an emergency which finds the physician and attendants somewhat prepared. In other cases, as after surgical injury, where there is an element of shock, or after pulmonary hæmorrhage in tuberculosis, it has not been followed by a flattering degree of success. In intestinal hæmorrhage of typhoid fever, it may be tried with a prospect of good results. The quantity of blood need not be more than from four to eight ounces; it acts as a powerful vital stimulant to the heart, and is capable of tiding the patient over an emergency. In morbid states of the blood, transfusion has been performed, in a limited number of cases, without very encouraging results. In anæmia it has failed, but in the hæmorrhagic diathesis favorable reports are given by Dr. Joseph Buchser, of New York, though Dr. D. J. Brakenridge asserts that in pernicious anæmia transfusion exerts a beneficial influence, both on the blood of the patient and on the blood-forming organs, causing a disappearance of abnormally formed blood vessels and increasing the number of cells in excess of those supplied by the transfused blood. In carbonic-acid poisoning and phosphorus poisoning, transfusion has been used successfully. It has also been recommended in the treatment of toxic symytoms from unknown drugs, or where there are no known antidotes. In uræmic poisoning it has been resorted to with satisfactory results.

Dr. Hodder, of Montreal, used injection of warm milk successfully in cases of **cholera** collapse, and Thomas, of New York, employed the same expedient successfully in **post-partum hæmorrhage**. Injections of a saline solution, such as that of Hayem, have been very successfully performed in the stage of collapse in Asiatic cholera, or cholera morbus.

The use of the blood of the lower animals, advocated by Gesellius and others, is not to be recommended, on account of the difference in size of the blood-corpuscles and the danger of communicating infectious diseases or introducing parasitic organisms.

The injection of blood into serous cavities, such as the peritoneum, has been recommended by Ponfick and indorsed by Bizzozero and Golgi, and has been successfully practised. Inasmuch as the rate of absorption is uncertain and the dangers of peritonitis imminent, it cannot be said that peritoneal transfusion is destined to be a rival of the classic form, which has for its chief advantage promptness of remedial action, thus gaining time for other remedial agents to act.

**Enteroclysis; Irrigation of the Bowels, Injections, Clysters, and Enemata.**—Fluids or semi-fluid substances are injected into the bowels through the anal aperture in greater or less quantity, according to the extent of intestinal surface intended to be brought into contact with or to be affected by the medicament employed. The objects to be attained are the direct local effects upon the bowels, and the indirect or secondary effects, which are caused either by absorption of a portion of the enema into the blood, or by an effect upon the nervous system or upon the temperature of the body. Enemata or injections are given (1) to cause prompt evacuations from the bowels; (2) to affect the thermal, chemical, or bacterial characters of the bowel contents, or act upon its mucous membrane; (3) to introduce certain substances into the circulation and produce systemic effects.

For making injections into the bowel a special instrument is employed, which was formerly called a clyster pipe; it is now known by the general term of syringe. Various forms of syringes are offered to the profession. The simplest syringe is one with a cylindrical barrel, containing a plunger and piston-rod, to which a ring or other conveniently-shaped handle is affixed, the opposite extremity terminating in a nozzle. The best syringes of this kind are made of hard rubber, which have almost entirely driven those of glass or pewter from the market. For an adult the syringe should have a capacity of from four to eight ounces, which is usually sufficient for a simple enema, although several pints may be required. In childhood, from one to four ounces will prove sufficient, and in infancy from half an ounce to one ounce is ordinarily enough for an opening injection. Continuous-flow syringes are of two kinds: (1) gravity, or so-called fountain syringe, and (2) bulb, or force syringes. The fountain syringe consists of a bag, with a capacity of a pint or more, connecting at the bottom with six feet or more of soft-rubber hose, to the end of which is affixed the usual anal, rectal, or vaginal tube. The bag, filled or partly filled with the fluid to be employed in the injection, is hung at the patient's bedside, from four to six feet above the level of the lower end, when introduced into the vagina or rectum; in this way the fluid gradually is introduced by hydrostatic pressure, without any other force being employed. The bulb syringes are of different shapes, but the principle is almost the same in all. A rubber-ball of cylindrical shape, with tapering ends, and of convenient size to grasp in the hands, is provided at each extremity with a valve, each opening in the same direction, A supply-tube passes from a receptacle of water, or the fluid to be employed in the injection, to one end of the bulb, and from the opposite end passes the delivery-tube, terminating in a nozzle of hard rubber. By alternately pressing and releasing the bulb, a current of fluid is sent along the tubing with as much force as is desired. In fact, there is danger of using greater hydraulic pressure than was intended, and thus causing injury to the bowel, especially when weakened by disease or ulceration, such as occurs in dysentery or typhoid fever. One form of syringe makes use of air-pressure, instead of hydraulic pressure, the fluid being placed in a bottle conected with the delivery tube and partly filled with the medicament desired to be thrown into the bowel. When air is pumped into the bottle the liquid is forced out through the delivery-tube under less pressure than by the usual plan just described.

(*a*) Some formulæ for laxative enemata are as follow:—

*Simple Laxative.*

| | |
|---|---|
| ℞ Olei ricini vel olivæ, | f℥ij. |

Add to a pint of soapy water, and use as an injection.

*Stimulative.*

| | |
|---|---|
| ℞ Olei terebinthinæ, | f℥ss. |
| Olei ricini, | f℥iss. |

Add to a pint or two of hot soap-suds, and use as an enema.

*Purgative.*

| | |
|---|---|
| ℞ Tinct. aloes, | fʒij. |
| Ol. olivæ, | f℥ij. |

In a pint of soapy water.

*Evacuant.*

| | |
|---|---|
| ℞ Glycerini, | ♏xx–fʒiv. |

Use as a rectal injection.

In cases of obstinate impaction a long tube should be inserted, so as to carry the glycerin into the vicinity of the mass and assist in breaking it up.

*For Infants.*

| | |
|---|---|
| ℞ Ol. olivæ opt., | f℥ss. |

To be injected into the bowel to produce evacuation.

*For Chronic Constipation.*

| | |
|---|---|
| ℞ Sem. lini., | ℥ss. |

Make an infusion with a pint of boiling water, and, when cold, strain through muslin. Use each morning, as an enema.

(*b*) Injections administered for the purpose of affecting the thermal chemical, or bacterial character of the contents of the bowel or to act upon its mucous membrane.

When comparatively large quantities of fluid are thrown into the bowel, the procedure is known as irrigation; and, when they pass the ileo-cæcal valve, as "enteroclysis." Such large injections are not required for simple evacuation of the bowels, but are employed for various purposes connected with the state of the intestine or its contents. Thus, in states of fever, especially typhoid, large injections of cold water may be given, in order to remove the contents of the bowel, to reduce temperature, and for their effects upon the nervous system. In cholera, a form of irrigation is highly praised by Cantani, which is called **enteroclysis,** because by this means remedies are carried, by an antiperistaltic motion, through the ileo-cæcal valve into the small intestine. Tannic acid being very destructive to cholera cultures, and, in the quantities employed, harmless to the human subject, was chosen as the principal agent to be used in the injection. The formula employed by Cantani was as follows:—

| | | | |
|---|---|---|---|
| ℞ | Acid. tannic., . . . . | grm. 5 to 20 | (ʒj gr. xviij–ʒv gr. viij). |
| | Acaciæ pulv., . . . . | grm. 50 | (℥iss). |
| | Vini opii, . . . . . | gtt. xxx. | |
| | Aquæ (temp. 100° to 104° F.), . | litres 2 | (4 pints). |

M. Sig.: To be used after each evacuation of the bowels.

Out of one hundred and seventeen cases of cholera treated by the above method Lustig reported thirty-four deaths only, which is highly favorable as compared with other methods of treatment. The same plan has been used in cholera infantum and in summer, or sporadic, cholera, with excellent effects. In addition to these injections of tannin into the bowel, Cantani recommended **hypodermoclysis**, which consists in the introduction of a saline solution (3 per cent. sodium carbonate and 4 per cent. sodium chloride), at a temperature a little above that of the body (100.4° to 104° F.), into the subcutaneous connective tissue, by means of a Pravaz, or large hypodermic, syringe. In true cholera, during the algid state, the practice of hypodermoclysis is said to give startling results. Its object is to reduce the tendency to thickening of the blood following loss of watery fluids by transudation. Its advantages over intra-venous injections consist not alone in avoidance of the danger of opening or manipulating veins, but also in the process of absorption being more uniform and natural. In one hundred and eighty-seven severe cases thus treated the mortality was 39 per cent. Enteroclysis is used for the premonitory diarrhœa and the first stage, hypodermoclysis in the algid and typhoid stages; when the treatment is begun with the disease already advanced, both are used.* In some cases, "**peritoneoclysis**," or injection of saline fluid into the peritoneal sac, was cautiously practised, without evil results, except slight tenderness and tympanites. Enteroclysis, or irrigation of the small bowel with warm water, is a valuable expedient in catarrhal jaundice and gall-stones. In the treatment of thread-worms, or oxyurides, large injections of salt water or infusion of quassia, or of black tea, are very efficient in dislodging these parasites from their headquarters in the cæcum and large bowel.

Astringent enemata are sometimes employed to check diarrhœa, and anodynes may be thus administered. For instance, laudanum (♏xxx) in starch-water is very useful in relieving pain and tenesmus. Nitrate of silver (gr. ii–viij to a pint of warm water) is used in dysentery, especially if ulceration be present; it may be repeated once or twice daily. Carbolic acid, mercurial salts, and other agents which, if absorbed, would cause poisoning, should not be employed per enema. Very frequently, diarrhœa is kept up by the presence of irritating substances in the intestine. Irrigation of the bowel has been found to be a resource of great value in such cases; and, even in infants, it has given highly satisfactory results.

The mechanical effects of the distention of the bowel are chiefly utilized in the treatment of intussusception of the bowels; but they are also active in every case in which the administration of an enema is followed by evacuation of the bowel contents. In some abdominal operations it has been recommended to introduce a rubber bag into the rectum and distend it by the injection of water, so as to lift the organs in front of the bowel higher up in the pelvis, so that they may be more readily encountered by the supra-pubic incision; the expedient just mentioned being of especial application in the case of stone in the bladder.

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* Annual of the Universal Medical Sciences, 1889, vol. i, D 32.

(*c*) Injections into the bowel for the purpose of systemic effects are of two kinds: (1) medicinal; (2) nutritive. Medicinal enemata of tannin in cholera have been mentioned under the head of "Enteroclysis." In many instances remedies are administered in the form of a suppository of cacao-butter, which is fluid at the temperature of the body; but the same mendicaments might be given in starch-water or other vehicle by enema. Quinine may be thus administered to children for malarial manifestations. Bromide of potassium and chloral are useful in reducing restlessness and tendency to convulsions in children; milk of asafœtida is an excellent injection to be administered in a case of convulsions where there is supposed to be indigestible substances in the bowels acting as an irritant. Enemata containing alcoholic stimulants are sometimes administered. Although this method of administration of remedies is attended by some inconveniences, yet it is very useful where the stomach is irritable or the patient is unable to swallow drugs, as in coma, etc. It is capable of being extended in the case of children, who object to swallowing disagreeable medicine. In the treatment of phthisis good results have been reported following the use of sulphuretted waters by enema. The administration of nutritive material by injection into the bowel is of sufficient importance to be considered separately.

**Rectal Alimentation and Intestinal Inhaustion.**—It is a physiological fact that the absorbing surface of the large bowel may be utilized to support life when the stomach cannot digest food. Experience has shown, indeed, that life may be almost indefinitely sustained by the injection into the bowel of certain articles of food in a physical condition favorable for absorption. In gastric ulcer, for instance, it is necessary to allow the stomach time to heal without being called upon to digest food, not only because of the pain and vomiting following the taking of food and the danger of hæmorrhage, but also because cicatrization will proceed more rapidly if, uninterrupted. During this time, therefore, it is of great importance to introduce food by a channel which so fully answers the purpose and which is so closely allied to the normal. The same proximate principles of the food can be introduced into the system when placed in the bowel as when they are taken into the stomach, the chief differences being that the food is not subjected to the same churning process in the bowel as in the stomach, and, of course, no gastric juice is furnished by the mucous coat of the large intestine. The capacity of the rectum is considerably less than that of the stomach. From this, we learn that nutritive enemata should consist of food in form most favorable for absorption and assimilation, and that the quantity should be comparatively small (about 4 to 6 ounces), in order not to excite reflex contractions of the muscles by reflex action and rejection of the enema. It is desirable to set up a tolerance on the part of the bowel to the injections; and they should, at first, be given cautiously and a small quantity at a time, and repeated not oftener than at intervals of four hours. It may be necessary to reduce the sensitiveness of the mucous membrane by a preliminary injection of tincture of opium (♏xxx) in starch-water, or an opium suppository may be introduced. In children, bromide of potassium and chloral may be substituted for the opium, or simple injections of cold water may suffice to render the bowel less intolerant. Cocaine is so uncertain in its action in different individuals that its use is not deemed advisable for this purpose.

The directions for preparing nutritious enemata are very simple. It is more convenient to have the substance in a fluid or semi-fluid condition and strained, so that it will pass through the syringe. Meat suppositories have also been used, but they are less efficient than enemata. The basis of the injection is usually milk, which should be scalded and partly peptonized. To this, meat-extracts, beef-juice, or Bovinine may be added. If desired, a small quantity of brandy or whisky can be added also. The enema should not exceed two ounces at first, and the frequency of administration must be governed by the demands of the system and the tolerance of the bowel. If alimentation can be conducted in this manner every four hours and it is well borne by the patient, this interval should be maintained. In some patients, however, the interval may have to be prolonged to seven or eight hours, especially at the beginning. On a previous page of this work directions will be found for peptonizing different articles of food, some of which on account of the predigestion, might be used for rectal alimentation. The late Prof. Henry F. Campbell, of Augusta, Ga., called special attention to this method of supporting the powers of life by nutritious enemata, and he maintained, by introducing the food above the sigmoid flexure, that the liquid would be carried backward through the ileocæcal valve into the small intestine by a process of reverse peristalsis due to intestinal inhaustion. He showed that the system could be nourished perfectly and life sustained for many months by nutritive enemata. Milk injections containing the yelks of one or two eggs, with some powdered pancreatin or solution of pancreatin or papoid, will be found the most available and generally efficient. The juice of raw beef, or meat-extract, may be added to the enema after toleration has been established.

This method is to be used in gastritis, some cases of dyspepsia, gastric ulcer, carcinoma of the stomach, insufficient nutrition, persistent vomiting or pain after taking food, and in marasmus and other affections of young children. According to G. Singer, nutrient enemata given in gastric ulcer diminish the probability of recurrent hæmorrhage. This writer advises rectal feeding in some cases of gastric dilatation and in excessive vomiting of pregnancy. In special conditions of disease it may also be resorted to with advantage; its utility in skin disease is sometimes very marked. (See a communication on "Rectal Alimentation and Medication in Diseases of the Skin," by the author. "Transactions of the Ninth International Medical Congress," vol. iv, page 170 *et seq.*) For further discussion of the important subject of alimentation the reader is referred to the section upon "Diet in Disease" (page 270 *ante*).

**Setons and Issues.**—These are expedients which had their origin in former ideas of pathology, and, consequently, at the present day, are nearly obsolete. Each depends upon setting up a point of irritation and suppuration on the surface of the body, in order to produce revulsive or counter-irritant effects upon deeper-seated pathological processes. A **seton** consists of a strand of cotton or silk, or other material, passed through a small fold of skin. A piece of silver wire or a strip of sheet-lead may be used. The thread may be carried through by means of a seton-needle, or the skin may first be perforated for the purpose with a bistoury. The seton is allowed to remain in position for several days or even weeks.

An **issue** is made by applying a cauterizing substance, such as caustic potassa, to a spot upon the skin, and, after the slough has separated, a dried pea, glass bead, or piece of orris-root is kept in place over the open surface by a bandage, so as to keep up irritation.

Setons in the neck (nucha) were formerly used in cases of obscure brain or spinal disease and eye inflammations. In infantile hydrocele of the cord, a seton may be inserted for a few hours to set up adhesive inflammation. Issues and setons are now rarely employed, because of the danger of the wound becoming infected with erysipelatous, tuberculous, or other germ disease, and because continued suppuration may lead to septicæmia, Bright's disease of the kidneys, or lardaceous degeneration of other organs.

**Suspension in Disease of Spinal Cord, and Nerve-Stretching in Nervous Disorders.**—Among the mechanical means occasionally resorted to in medical practice is support of a portion of the body by suspension. Thus, in internal curvature of the spine, systematic exercise, with suspension more or less complete, by instructing the patient to climb a ladder, or a rope hand over hand, is a highly useful device for strengthening weak muscles and overcoming deformity. The same principle is applied in treating Pott's disease by Sayre's apparatus with a "jury mast."

A suspension belt encircling the elbows so that the patient may sleep in a sitting posture, and a support afforded to the extrinsic respiratory muscles, forms an apparatus of great usefulness in asthma. About 1883, Motschutkowski, of Odessa, published reports of the relief afforded in cases of loco-motor ataxia by suspension of the body from the shoulders. This method, it seems, was first applied by Prof. J. K. Mitchell, in Philadelphia, many years before. Motschutkowski and, subsequently, Charcot arrived at favorable conclusions from their experiments, and Prof. S. Weir Mitchell has also published commendatory accounts of his experience with a form of apparatus of his own devising.

The effect of the treatment by the apparatus of Charcot or Weir Mitchell is to take pressure from the intervertebral cartilages and to straighten the curves of the spine. The good effects which have undoubtedly occurred in a number of cases may be due, as suggested by Dr. Julius Althaus, to the fact that spinal meningitis usually is found associated with pathological changes in the cord, especially in the posterior columns. Suspension produces a revulsive effect similar to that of cauterization and to passive motion of joints by which adhesions are stretched or broken and their absorption favored. Since suspension has given the most favorable results in old, advanced cases, it is very probable that this is true. There is no evidence that the spinal cord is stretched by this process; on the contrary, it may be relaxed. There have been some unfavorable results reported; but, considering the character of the cases, such accidents might be attributed to other causes, and certainly do not constitute a bar to the treatment when properly applied. Rosenbaum advises against suspension in pronounced cases of myelitis and in recent paralysis agitans.

The diseases in which suspension has proved beneficial, besides locomotor ataxia, are spastic spinal paralysis and amyotrophic lateral sclerosis and neurasthenia, or functional nerve-prostration. S. Weir Mitchell is especially convinced of its utility in Pott's disease of the spine.

The number of papers published during the last two or three years, upon suspension in the treatment of nervous diseases, has been small, as compared with the large number appearing soon after Motschutkowski's early papers upon this subject. The same reports of improvement and disappearance, in part or entirely, of symptoms, have characterized recent communications. In a small proportion (in five out of twenty-five hundred cases of Rosenbaum) the improvement is remarkable. The lancinating pains are relieved, there is enhanced ability to walk, increase in appetite and bodily weight, and in sleep. The gastric crisis, in a few cases, become less frequent, but paræsthesia of hands and feet and ocular symptoms are very obstinate.

Professor Leyden claims that the treatment of tabes by suspension produces no appreciable effect upon the pathological process; that neither on therapeutic nor upon scientific grounds is it reasonable to expect such a curative action, and that practical experience, when viewed with an unprejudiced eye, fails to show such effects; none of the results reported, he says, go beyond the effects of suggestion.

At Charcot's clinical service at La Salpêtrière, the form of suspension is by the chin and occiput, and the instrument employed is Motschutkowski's modification of Sayre's apparatus. Stillman* recommends the upright and recumbent curved board frames devised for orthopædic purposes.

Benuzzi has tried forcible flexion of the spine as a substitute for suspension, by forcibly flexing the body with the knees bent on the abdomen. A tabetic female treated in this manner showed material improvement. He experimented upon the cadaver and concluded that by this procedure the relation of the spinal cord to the spinal column is so changed that the cord is displaced upward three to four millimetres, and the vertebral column lengthened from one and one-half to three centimetres, the increase in length being due to separation of the processess rather than of the vertebral bodies. The nerve roots are displaced, but not noticeably shortened, with the exception of the **cauda equina**; there is lowered tension of the cerebro-spinal fluid. He regards the beneficial effects of suspension as due to traction upon the **cauda equina**, stretching it and, through it, the spinal cord; this, he thinks, is best accomplished by forcibly flexing the body with the knees upon the abdomen. Cagney, on the other hand, after extensive experiments upon both the dead and living body, denies that it is possible to stretch the spinal cord or nerve-roots by suspension; that instead of extension of the spinal canal, there is a total shortening of it. He inferred that if the cord is benefited by suspension it is by relaxation and not by stretching it.*

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* *Weekly Medical Review*, St. Louis, September 6, 1890.

**Nerve-stretching** is a recently introduced expedient for the treatment of various affections of the nerves attended by pain. As it involves a surgical operation,—the cutting down upon a nerve-trunk, isolating it, and subjecting it to more or less forcible stretching,—it need not be discussed here. It might be said, however, that in some cases of neuralgia (sciatica, etc.) this has been resorted to with marked relief to the patient, and that it is now an acknowledged surgical *dernier ressort* for such cases.

## FORMULÆ FOR HYPODERMIC USE.

### ALCOHOL.

| | |
|---|---|
| ℞ Spir. frumenti, | f℥ss. |

(Dose: ♏xx–xxx.)

| | |
|---|---|
| Or, ℞ Spir. vini gallici, | f℥ss |

(Dose: ♏x–xxx.)

For syncope, hæmorrhage, heart-failure, shock, cholera, and snake-bites.

### AMYL NITRITE.

| | |
|---|---|
| ℞ Amyl nitritis, | fʒj. |
| Alcoholis, | fʒiij. |

(Dose: ♏x–xx.)

For angina pectoris, chloroform narcosis, strychine poisoning, and surgical shock.

### APOCODEINE.

| | |
|---|---|
| ℞ Apocodeinæ hydrochloratis, | gr. ij. |
| Sodii chloridi, | gr. x. |
| Aquæ eucalypti, | f℥ss. |

M. (Dose: ♏xxx = gr. $\frac{1}{4}$.)

For chronic bronchitis, croup, whooping-cough, and hæmoptysis.

### APOMORPHINE.

| | |
|---|---|
| ℞ Apomorphinæ hydrochloratis, | gr. ij. |
| Aquæ camphoræ, | ♏c. |

M. (Dose: ♏ii–viij = gr. $\frac{1}{25}$–$\frac{1}{6}$.)

For chronic bronchitis, bronchorrhœa, emphysema, hæmoptysis, chorea, whooping-cough, laryngismus stridulus, epilepsy, capillary bronchitis, and in narcotic poisoning.

### AQUAPUNCTURE.

| | |
|---|---|
| ℞ Aquæ destillatæ, | f℥ij. |

(Dose: fʒss–j.)

For neuralgia, myalgia, and paralysis.

### ARSENIC.

| | |
|---|---|
| ℞ Liquoris potassii arsenitis, | |
| Aquæ destillatæ, | āā f℥ij. |

(Dose: ♏v–xx.)

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* Annual of the Universal Medical Sciences, 1861, vol. ii, p. B-38.

Or, ℞ Liquoris sodii arsenatis, . . . . . . . . f ʒj.
(Dose: ♏v–xx.)

Or, ℞ Liquoris arseni et hydrargyri iodidi, . . . . . f ʒij.
(Dose: ♏i–x.)

For chorea, neuralgia, epilepsy, lymphadenoma, enlarged spleen, psoriasis, and chronic eczema.

### ATROPINE.

℞ Atropinæ sulphatis, . . . . . . . . gr. $\frac{1}{8}$.
Aquæ destillatæ, . . . . . . . . . f ℥ss.
M. (Dose: ♏xxx = gr. $\frac{1}{64}$.)

For sciatica, ovarian neuralgia, dysmenorrhœa, surgical shock, cholera collapse, pulmonary hæmorrhage, locomotor ataxia, mania, spasmodic asthma, seasickness, poisoning from aconite, muscarine, physostigmine or eserine and opium.

### CAFFEINE.

℞ Caffeinæ citratis, . . . . . . . . . gr. xvj.
Aquæ destillatæ, . . . . . . . . . f ℥j.
M. (Dose: ♏xv–xxx = gr. ss–j.)

For neuralgia, hypochondriasis, asthma, organic heart disease, chronic Bright's disease, and uræmic coma.

### CARBOLIC ACID.

℞ Acidi carbolici pur., . . . . . . . . gr. iv.
Aquæ destillatæ, . . . . . . . . . f ℥ss.
M. (Dose: ♏xv–xxx = gr. $\frac{1}{4}$–ss.)

For erysipelas, phthisis pulmonum, furunculus, carbunculus, enlarged lymphatic glands, bubo, and neuralgia.

### CHLORAL HYDRATE.

℞ Chloral. hydratis, . . . . . . . . . ℥ss.
Aquæ destillatæ, . . . . . . . . . f ℥j.
M. (Dose: ♏x–xxx = gr. v.–xv.)

*Chloral Hydrate and Morphine.*

Or, ℞ Chloral. hydratis, . . . . . . . . . ʒij.
Morphinæ sulphatis, . . . . . . . . gr. ij.
Aquæ destillatæ, . . . . . . . . . f ℥j.
M. (Dose: ♏xxx = gr. viiss chloral hydrate; gr. $\frac{1}{8}$ morphine sulphate.)

*Chloral Hydrate, Morphine, and Atropine.*

Or, ℞ Chloral. hydratis, . . . . . . . . . ʒij.
Morphinæ sulphatis, . . . . . . . . gr. ij.
Atropinæ sulphatis, . . . . . . . . gr. $\frac{1}{8}$.
Aquæ destillatæ, . . . . . . . . . f ℥j.
M. (Dose: ♏xxx = gr. viiss chloral hydrate; gr. $\frac{1}{8}$ morphine sulphate; gr. $\frac{1}{128}$ atropine sulphate.)

For obstinate vomiting or hiccough, collapse from cholera Asiatica or cholera nostras, spasmodic asthma, mania, convulsions, and neuralgia.

### CHLOROFORM.

℞ Chloroformi purificat., . . . . . . . . . f ℥ss.
(Dose: ♏v–xv.)

Or, ℞ Spirit. chloroformi: . . . . . . . . . f ℥ss.
(Dose: ♏x–xx.)
For sciatica, tic douloureux, and other neuralgiæ.

### COCAINE.

℞ Cocainæ hydrochloratis, . . . . . . . . gr. viij.
Aquæ eucalypti, . . . . . . . . . f ℥j.
M. (Dose: ♏xxx = gr. ss.)

For producing local anæsthesia. Also in seasickness and vomiting of pregnancy.

### CODEINE.

| | |
|---|---|
| ℞ Codeinæ, | gr. iv. |
| Aquæ destillatæ, | f℥ ss. |

M. (Dose: ♏xxx = gr. ss.)

For neuralgia, hypochondria, delirium tremens, mania, and diabetes mellitus.

### CODLIVER-OIL.

| | |
|---|---|
| ℞ Olei morrhuæ, | f℥ j. |

(Dose: fʒ i–iv.)

For scrofuloderma, paræsthesia, ecthyma, pemphigus, lichen, etc.

### CONIINE.

| | |
|---|---|
| ℞ Coniinæ, | fʒ iij ♏xij. |
| Acidi acetici fort., | fʒ iij ♏xij. |
| Aquæ chloroformi, | q. s. ad f℥ ij. |

M. (Dose: ♏j to begin with. ♏v contain ♏j of coniine.)

Or,

| | |
|---|---|
| ℞ Coniinæ hydrobromatis, | gr. j. |
| Aquæ eucalypti, | f℥ ss. |

M. (Dose: ♏x = gr. $\frac{1}{48}$.)

For pleurisy, pneumonia, angina pectoris, emphysema, asthma, acute mania and tetanus.

### COTOINE.

| | |
|---|---|
| ℞ Cotoinæ, | gr. viij. |
| Sodii bicarbonatis, | gr. xx. |
| Aquæ destillatæ, | f℥ ss. |

M. (Dose: ♏x–xxx = gr. $\frac{1}{3}$–j.)

For acute and chronic diarrhœa, diarrhœa of phthisis and typhoid fever. Also for night-sweats and Asiatic cholera.

### CURARA.

| | |
|---|---|
| ℞ Curaræ, | gr. j. |
| Aquæ destillatæ, | fʒ v. |

M. (Dose: ♏xxx = $\frac{1}{10}$ grain.)

Or,

| | |
|---|---|
| ℞ Curarinæ sulphatis, | gr. $\frac{1}{20}$. |
| Aquæ destillatæ, | fʒ v. |

M. (Dose: ♏xxx = gr. $\frac{1}{200}$.)

For tetanus, hydrophobia, chorea, and epilepsy.

### DATURINE.

| | |
|---|---|
| ℞ Daturinæ, | gr. $\frac{1}{5}$. |
| Aquæ eucalypti, | f℥ j. |

M. (Dose: ♏x–xx = gr. $\frac{1}{240}$–$\frac{1}{120}$.)

For neuralgia, asthma, epilepsy, and mania.

### DIGITALIS.

| | |
|---|---|
| ℞ Tincturæ digitalis, | fʒ ij. |

(Dose: ♏v–xv.)

Or,

| | |
|---|---|
| ℞ Tincturæ digitalis, | |
| Spir. frumenti, | āā fʒ ij. |

M. (Dose: ♏x–xxx.)

Or,

| | |
|---|---|
| ℞ Digitaline, | gr. $\frac{1}{5}$. |
| Spir. vini gallici, | |
| Aquæ destillatæ, | āā fʒ ij. |

M. (Dose: ♏x–xx = gr. $\frac{1}{120}$–$\frac{1}{60}$.)

For heart-failure, surgical shock, acute mania, hæmorrhage, and aconite poisoning.

### DUBOISINE.

℞ Duboisinæ hydrochloratis, . . . . . . . . gr. $\frac{1}{5}$.
Aquæ destillatæ, . . . . . . . . . f℥j.
M. (Dose: ♏x–xx = gr. $\frac{1}{240}$–$\frac{1}{120}$.)
For asthma, locomotor ataxia, mania, sciatica, and dysmenorrhœa.

### ERGOT.

℞ Extract. ergotæ fl., . . . . . . . . . f℥ss.
(Dose: ♏xv–xxx.)

Or, ℞ Ergotin.. . . . . . . . . . . . . gr. xxxij.
Acidi carbolici pur., . . . . . . . . . ♏iij.
Aquæ destillatæ, . . . . . . . . . . f℥ss.
M. (Dose: ♏viiss–xv = gr. i–ij.)

For hæmoptysis, post-partum hæmorrhage, intestinal hæmorrhage of typhoid fever, purpura, uterine fibromata, varicose veins, varicocele, aneurism, enlarged spleen, enlarged prostate, leukæmia, and exophthalmic goitre.

### ETHER.

℞ Ætheris loti, . . . . . . . . . . . f℥ss.
(Dose: ♏xx–xxx.)

For heart-failure, surgical shock, syncope from hæmorrhage, snake-bites, tyhoid pneumonia, variola, sciatica, biliary and renal colic, poisoning from aconite and veratrum viride.

### GLONOIN (NITRO-GLYCERIN).

℞ Glonoini, . . . . . . . . . . . . . ♏j.
Sp. vini rectificati, . . . . . . . . . . ♏ccc.
M. (Dose: ♏i–iv.)

For angina pectoris, asthma, epilepsy, tetanus, chloroform narcosis, and strychnine poisoning.

### HOMATROPINE.

℞ Homatropinæ hydrobromatis, . . . . . . . gr. $\frac{1}{5}$.
Aquæ destillatæ, . . . . . . . . . . f℥j.
M. (Dose: ♏x–xxx = gr. $\frac{1}{240}$–$\frac{1}{80}$.)
For night-sweats of phthisis, mania, and sciatica.

### HYOSCINÆ.

℞ Hyoscinæ hydrobromatis, . . . . . . . . gr. $\frac{1}{5}$.
Aquæ destillatæ, . . . . . . . . . . fʒx.
M. (Dose: ♏xxx = gr. $\frac{1}{100}$.)
For chronic mania and dementia, insomnia, asthma, and sciatica.

### HYOSCYAMINE.

℞ Hyoscyaminæ sulphatis, . . . . . . . . gr. $\frac{1}{5}$.
Aquæ eucalypti, . . . . . . . . . . f℥j.
M. (Dose. ♏xx–xxx = gr. $\frac{1}{120}$–$\frac{1}{80}$.)

For acute and chronic mania, chronic dementia, epilepsy, paralysis agitans, and chorea.

### MERCURY.

℞ Hydrarg. chlorid. corros., . . . . . . . . gr. j.
Aquæ destillatæ, . . . . . . . . . . fʒij.
M. (Dose: ♏x = gr. $\frac{1}{12}$, once daily.)

Or, ℞ Hydrarg. chlorid. corros., . . . . . . . . gr. v.
Sodii chloridi, . . . . . . . . . . . gr. x.
Aquæ destillatæ, . . . . . . . . . . f℥j.
M. (Dose: ♏x–xx = gr. $\frac{1}{10}$–$\frac{1}{5}$, every second or third day).

| | |
|---|---|
| Or, ℞ Hydrarg. chlorid. corros., | gr. v. |
| Glycerini, | f ʒ j. |
| Aquæ destillatæ, | f ʒ vij, |

M. (Dose: ♏xij = gr. $\frac{1}{8}$, every second day.)

| | |
|---|---|
| Or, ℞ Hydrarg. cnloridi mitis, | gr. viij. |
| Olei olivæ, | f ℥ ss. |

M. (Dose: ♏xv–xxx = gr. ss–j, twice weekly.)

| | |
|---|---|
| Or, ℞ Hydrarg. chloridi mitis, | gr. xvj. |
| Petrolati fl., | f ℥ ss. |

M. (Dose: ♏xv–xxx = gr. i–ij, twice weekly.)

| | |
|---|---|
| Or, ℞ Hydrarg. formamid., | gr. ij. |
| Aquæ destillat., | f ʒ vj. |

M. (Dose: ♏xxx = gr. $\frac{1}{6}$.)

| | |
|---|---|
| Or, ℞ Hydrargyri benzoatis, | gr. iv. |
| Sodii chloridi, | gr. ss. |
| Aquæ destillatæ, | f ℥ iss. |

M. (Dose: ♏xv = gr. $\frac{1}{12}$.)

For syphilis and psoriasis.

### MORPHINE.

| | |
|---|---|
| ℞ Morphinæ sulphatis, | gr. j. |

Div. in chart. no. viij.

(Dose: One powder = gr. $\frac{1}{8}$, dissolved in 30 minims of water.)

| | |
|---|---|
| Or, ℞ Morphinæ sulphatis, | gr. ij. |

Div. in chart. no. viij.

(Dose: One powder = gr. $\frac{1}{4}$, dissolved in 30 minims of water.)

For neuralgia, uræmic convulsions, asthma, angina pectoris, colic, and cancer.

### MORPHINE AND ATROPINE.

| | |
|---|---|
| ℞ Atropinæ sulphatis, | gr. ss. |
| Morphinæ sulphatis, | gr. xx. |

M. et div. in chart. no. cxx.

(One powder = atropine sulphate gr. $\frac{1}{240}$, morphine sulphate gr. $\frac{1}{6}$, to be dissolved in 30 minims of water.)

| | |
|---|---|
| Or, ℞ Atropinæ sulphatis, | gr. $\frac{1}{4}$. |
| Morphinæ sulphatis, | gr. vj. |
| Acid. carbolici pur., | gr. v. |
| Aquæ eucalypti, | f ℥ j. |

M. (Dose: ♏x = atropine sulphate gr. $\frac{1}{192}$, morphine sulphate gr. $\frac{1}{8}$.)

For insomnia, asthma, hiccough, myalgia, colic, herpes zoster, sciatica, angina pectoris, cancer, and surgical shock.

### MUSCARINE.

| | |
|---|---|
| ℞ Muscarinæ nitratis, | gr. xij. |
| Aquæ destillatæ, | f ℥ j. |

M. (Dose: ♏x–xxx = gr. $\frac{1}{4}$–$\frac{3}{4}$.)

For night-sweats of phthisis and atropine poisoning.

### NICOTINE.

| | | |
|---|---|---|
| ℞ Nicotinæ, | | gr. ss. |
| Mucilag. acaciæ, | | |
| Aquæ destillatæ, | āā | f ʒ j |

M. (Dose: ♏x = ♏$\frac{1}{20}$ of nicotine.)

For tetanus.

### OSMIC ACID.

℞ Acidi osmici, . . . . . . . . . . . gr. j.
Aquæ destillatæ, . . . . . . . . . . f ʒ v.
M. (Dose: ♏x–xxx = gr. $\frac{1}{30}$–$\frac{1}{10}$.)
For sciatica.

### PARACOTOINE.

℞ Paracotoini, . . . . . . . . . . . gr. xxiv.
Glycerini,
Aquæ destillatæ, . . . . . . . . . āā f ʒ ij.
M. (Dose: ♏x–xxx = gr. i–iij.)
For intestinal tuberculosis and other forms of diarrhœa.

Or, ℞ Pelletierinæ sulphatis, . . . . . . . . . ʒ j.
Aquæ destillatæ, . . . . . . . . . . f ʒ ij.
M. (Dose: ♏x = gr. v.)
For paralysis, tetanus, and hydrophobia.

### PHYSOSTIGMINÆ.

℞ Physostigminæ hydrochloratis, . . . . . . gr. j.
Aquæ destillatæ, . . . . . . . . . . f ʒ v.
M. (Dose: ♏x–xxx = gr. $\frac{1}{30}$–$\frac{1}{10}$.)

Or, ℞ Physostigminæ salicylatis, . . . . . . . gr. $\frac{1}{5}$.
Aquæ destillatæ, . . . . . . . . . . f ℥ ss.
M. (Dose: ♏x–xxx = gr. $\frac{1}{120}$–$\frac{1}{40}$.

Or, ℞ Extract. physostigmatis, . . . . . . . . gr. iv.
Aquæ destillatæ, . . . . . . . . . . f ʒ vj.
M. (Dose: ♏xxx = gr. $\frac{1}{3}$.)
For tetanus, hydrophobia, and strychnine poisoning.

### POTASSIUM IODIDE.

℞ Potassii iodidi, . . . . . . . . . . . ℥ ss.
Aquæ destillatæ, . . . . . . . . . . f ℥ j.
M. (Dose: ♏x–xxx = gr. v–xv.)
For syphilis, psoriasis, scrofula, and lead poisoning, rheumatism, and gout.

### PILOCARPINE.

℞ Pilocarpini hydrochloratis, . . . . . . . . gr. ij.
Div. in chart. no. xij.
(Dose: One or two powders = gr. $\frac{1}{6}$–$\frac{1}{3}$, dissolved in 30 minims of distilled water.)
For hiccough, asthma, dropsy, uræmia, and chronic eczema.

Or, ℞ Pilocarpinæ nitratis. . . . . . . . . . gr. xvj.
Aquæ eucalypti, . . . . . . . . . . f ℥ j.
M. (Dose: ♏v = gr. $\frac{1}{6}$.)

### QUININE.

℞ Quininæ sulphatis, . . . . . . . . . ℈ iv.
Acid. sulphurici dilut., . . . . . . . . . f ʒ iiss.
Acid. carbolici pur., . . . . . . . . . gr. ij.
Aquæ destillatæ, . . . . . . . q. s. ad f ℥ ss.
M. (Dose: ♏x–xxx = gr. iii–x.)

Or, ℞ Quininæ hydrochloratis carbamidatæ, . . . . . ʒ ij.
Div. in chart. no. xxiv.
(Dose: One or two powders = gr. v–x, in 30 minims of distilled water.)
For pernicious malarial fever, malarial cachexia, and sun-stroke.

### RICINI OLEUM.

℞ Olei ricini,
Olei amygdalæ dulcis, . . . . . . . . āā f℥j.
M. (Dose: ʒi–iv.)
Useful in obstinate constipation.

### STRYCHNINE.

℞ Strychninæ sulphatis, . . . . . . . . gr. j.
Aquæ eucalypti, . . . . . . . . f℥j.
M. (Dose: ♏x = gr. $\frac{1}{48}$.)

Or, ℞ Strychninæ sulphatis, . . . . . . . . gr. $\frac{1}{3}$.
Acid. carbolici pur., . . . . . . . . gr. j.
Aquæ, . . . . . . . . . . . . f℥j.
M. (Dose: ♏xv–xxx = gr. $\frac{1}{96}$–$\frac{1}{48}$.)
For paralysis, progressive muscular atrophy, neuralgia, amaurosis, amblyopia, surgical shock, and aconite poisoning.

### SPARTEINE.

℞ Spartein. sulphatis, . . . . . . . . gr. ij.
Aquæ eucalypti, . . . . . . . . . f℥ss.
(Dose: ♏x–xx = gr. $\frac{1}{12}$–$\frac{1}{6}$.)
For cardiac and renal dropsy.

### URETHAN.

℞ Urethan., . . . . . . . . . . . ʒj.
Aquæ eucalypti, . . . . . . . . f℥j.
M. (Dose: fʒj = gr. viiss.)
For insomnia, tetanus, mania and neuralgia.

## FORMULARY.

The following recipes for articles of food for the sick are in frequent demand :—

### *Raw Beef.*

Raw, lean beef, free from fat, may be pounded into a pulp in a mortar with some white sugar, and spread upon bread, to be taken as a sandwich by young children or rachitic infants. Or, with a rather dull knife, scrape a piece of tender meat, so as to separate the pulp from the fibrous portion. The soft mass thus obtained may be seasoned with salt and pepper, like sausage-meat, and eaten, spread upon biscuit or bread ; or it may be moulded into small balls and slightly browned on the outside in a hot oven. Meat-pulp may also be rubbed up with half its quantity of granulated white sugar, and in this form is readily taken by young children.

### *Beef-Tea, No. 2.*

Prepare a pound of good rump-steak by chopping it in small pieces and removing pieces of fibrous tissue and fat. Place it in a pint of cold water in a covered saucepan. Let it stand in a cool place for three hours, and then place it on the fire, where it may simmer gently for fifteen minutes ; season, and decant or strain through a horse-hair sieve. The meat should be as fresh as possible, and the saucepan enamelled upon its inner surface. Beef-tea must never be allowed to actively boil, and in re-heating it should only be raised to the proper temperature for drinking.

### *Calves'-Feet Broth.*

Two calves' feet are to be carefully cleaned and placed in two quarts of cold water, which is then brought to boil and kept boiling until the feet are reduced to shreds; strain liquid portion off, and add a little salt, and pepper if desired. When administered to the patient, it is to be warmed. It may be made more nourishing if, to each cupful, a beaten egg and two tablespoonfuls of fresh milk are added, and all brought quickly to a boil before serving. A dash of lemon-juice improves the flavor, and the broth may be taken with some crisp toasted bread.

### *Clear Brown Soup.*

Take a shin of fresh beef, cut it in pieces, and put into a saucepan with enough cold water to cover it. Bring it to a boil, and add a bundle of sweet-herbs, vegetables (a little sliced carrot, turnip, onion, celery, etc.), also pepper and salt to taste. Boil until the meat is tender, then strain, and let it stand in a cold place until the next day. Remove the fat from the surface and heat the broth, adding as much browning as will make the soup a proper color. Beat up two eggs with their shells until quite a froth, and put them into the soup with a whisk. Let it boil gently for ten minutes, when it may be decanted, or, if desired, it can be strained through a cloth, when it will be perfectly clear.

### *Consommé, or Bouillon.*

Take one or two pounds of beef from the leg, round, or chuck; wash well, cut in pieces, and put on to boil with three quarts of cold water. Skim frequently while boiling, and, when reduced to a quart, take from the saucepan and strain. Return to the saucepan and add a few thin slices of onions, half a pound of lean beef, chopped fine and well mixed with three raw eggs. A few bay-leaves may be added. Beat all thoroughly into the broth, which is to be returned to the fire and boiled for about half an hour. It should be made clear by straining through horse-hair sieve or muslin, and seasoned.

### *Oyster-Soup.*

The desired number of oysters, depending much upon their size, are allowed to drain through a colander for five minutes, and the liquor preserved. A pint of boiling water is then poured over them, which is thrown aside. Add to the liquor already drained a pint of hot water, and put over the fire in a porcelain-lined saucepan. Boil until all the scum has risen and has been skimmed off, then add half a pint of fresh milk, one powdered water-cracker, a piece of butter, and a little salt and pepper. One or two allspice may also be added. Boil for ten minutes, and, just before the soup is served, turn in the oysters from the colander and let them scald for three minutes, and then send to the table in a covered dish.

### *Chafed or Panned Oysters.*

Take a dozen large oysters, drain off the juice, and preserve it. Have a silver chafing dish or a porcelain-lined vessel over a fire, and place a piece of butter, as large as a walnut, in the vessel. When the butter indicates that the dish is sufficiently hot, the oysters are turned in, and a little salt and pepper added. When the oysters change color and curl up, they are placed in a hot dish. The oyster-juice is now turned into the chafing-dish, with a little cream, and brought to a boil and poured over the oysters. Dry toast may be cut into squares and served with the broth, if desired.

### *Roast Oysters.*

A dozen fresh oysters, not long out of their native bed, in their shells, are placed upon a stove or on a moderately strong fire until the shells open a little. They are then opened, preserving the juice, if possible, and served hot, with a little black pepper and salt, if needed. The tough part of the oyster (cartilaginous portion) need not be swallowed, if the patient be delicate. This is said, by Dr. Henry Hartshorne, from personal experience, to be relished and digested sooner than any other solid food in convalecence after fever.

### *Vegetable-Soup.*

Put two potatoes, a handful of peas, one ripe tomato, and a piece of stale bread into a quart of water, and boil to a pint. Add chopped celery or parsley and salt. Keep in a covered dish. Strain when served, if for a delicate stomach It may be made more nutritious by adding the yelk of one egg to each cupful, or some meat-extract, like Liebig's or Armour's.

### *Bread-and-Butter Soup.*

A piece of well-baked, rather stale, bread is to be spread with good, sweet butter and sprinkled with salt and pepper. Pour a pint of boiling water over it and allow it to stand for a few minntes. When cool enough, it may be eaten as an article of low diet by convalescent patients.

### *Panada.*

Two pieces of stale bread, deprived of crust, are to be toasted brown and cut into small squares. Lay them in a bowl and sprinkle with salt and a little nutmeg. Pour on a pint of boiling water, and let it stand to cool.

### *Toast-Water.*

Two pieces of stale bread are thoroughly browned in a hot oven. They are then placed in a bowl or pitcher, and a pint of boiling water poured over them. After standing until cold, the water is poured off into a pitcher and a slice or two of lemon placed on top. If desired, it may be sweetened with some crushed sugar and served cold. Patients are allowed to drink it freely, in place of water.

### *Tamarind or Currant-Jelly Water.*

A refreshing drink may be made for patients, in summer particularly, by placing some preserved tamarinds, free from their shells, in a glass of water which had been previously boiled. Where tamarinds are not to be had, currant-jelly may be used in the same way, in cases of bowel disorder or to allay thirst in fever.

### *Lemonade.*

Take two large, fresh lemons, and wash them clean with cold water. Roll them until soft; then divide each into two, and use a lemon-squeezer or reamer to express the juice into a small pitcher. Remove all the seeds from the juice; to which add four or more tablespoonfuls of white sugar, according to taste. A pint of boiling water is now added, and the mixture stirred until the sugar is dissolved. It should be drunk while hot, and is very effective in producing perspiration. Ice-water may be used instead of the hot water, and a piece of lemon-peel added; if desired, a weaker lemonade may be made by using more water. This is a refreshing, acidulous, and antiscorbutic drink, and is especially refreshing in hot weather. Limes or lime-juice may be used instead of lemons.

### *Milk-Jelly.*

Dissolve one ounce of gelatin in a cupful of warm water. Heat a quart of milk with a pound of white sugar for about ten minutes, aiding the solution of the sugar by stirring. Let the solution cool, and then add the gelatin solution, the juice of three or four lemons, and half a pint of wine or two wineglassfuls of brandy, stirring the mixture slowly, and pour into glasses or moulds and place in a cool place to stiffen. The object of allowing the milk to become cold is to prevent curdling when the other ingredients are added.

### *Gelatin.*

An ounce of sheet gelatin is dissolved in a pint of warm water, and this brought to a boil. Add one half-cupful of sugar, the juice of one lemon, and the white of an egg. Beat together well and pour into a mould and keep on ice. Serve a tablespoonful at a time, so as to encourage the patient to ask for more.

### *Wine-Jelly.*

One box and a half of Coxe's gelatin soaked in water one hour, must then have added three pints of boiling water, and one pint of sherry-wine, and two pounds of white sugar. The white of an egg and juice from three lemons are then added, and all strained through a fine sieve. The rind of one lemon is then sliced and put in, or small pieces of orange or other fruit used in place of the lemon-rind. Pour into cups or moulds and allow it to stand until it hardens.

### *Tapioca-Jelly.*

One cupful of tapioca is washed, and then placed in three cupfuls of cold water to soak for four hours. It is then placed in a water-bath and heated until it begins to clear, adding more lukewarm water if too thick. When quite clear add the juice of a lemon, a pinch of grated peel, and sweeten to taste. Pour into moulds. Serve cold with cream flavored with rose-water and sweetened.

### *Arrowroot Jelly.*

This is made like the preceding, using one cupful of boiling water to two heaping teaspoonfuls of arrowroot, and the same quantity of white sugar. A tablespoonful of brandy or three tablespoonfuls of wine make an agreeable addition.

### *Restorative Jelly.*

One-half box of Coxe's gelatin, one tablespoonful powdered gum arabic; one-half pint port-wine, a tablespoonful of lemon-juice, three tablespoonfuls of white sugar, and two cloves are mixed together and soaked for two hours. The mass is then placed in a bowl in a basin of boiling water, or a water-bath, and the ingredients dissolved by heat and constant stirring. Boil for a minute after the ingredients are melted, and then strain through a sieve or flannel jelly-bag, and set aside to cool. The port-wine may be replaced by any other liquor or beef-juice, if preferred. In the latter case, omit lemon and sugar and use salt. A spoonful at a time is sufficient for very ill patients.

### *Wine-Whey.*

Boil up half a pint of fresh milk and remove any scum that is formed. Stir in a wineglassful of sherry-wine and boil for a moment longer; strain as soon as the milk is curdled. Put on the ice, or, if used as a warm drink serve at once.

### *Milk-Punch* (*Egg Nogg*).

Beat the white of an egg into a froth and add to a tumblerful of cold, sweet milk and two tablespoonfuls of brandy well stirred in. The yelk of the egg is rubbed up with a tablespoonful of granulated sugar and mixed thoroughly with the other. A little nutmeg on the surface improves the flavor. It should be taken at once, quite cold, and preferably through a straw or glass tube.

### *Egg-Lemonade.*

Take the white of one egg, a tablespoonful of pulverized sugar, juice of one lemon, and one goblet of water and mix them intimately. A useful drink in sore throat.

### *Sago-Milk.*

Put three tablespoonfuls of sago in a cupful of cold water and let it stand one hour. Add three cupfuls of boiled milk; sweeten and flavor to taste. Allow this to simmer on a slow fire for half an hour; serve warm.

### *Rice-Water. Barley-Water.*

The rice, or barley, is washed and added to cold water, in the proportion of a tablespoonful to a pint. Allow it to stand in a warm place for two hours, then boil slowly for one hour, or until the water is reduced to one-half, and strain. If too thick, it may be thinned by adding boiled water or boiled milk. It is very useful in cases of summer diarrhœa, especially in children.

### *Rice-Milk.*

Two tablespoonfuls of rice and one teaspoonful of corn-starch are added to two pints of milk, and boiled in a farina-boiler until each grain of rice is soft and the whole assumes a creamy color. It may be sweetened and flavored as required.

### *Baked Milk.*

If half a gallon of milk be placed in a jar and the top covered by tying writing-paper over it, and allowed to stand in a moderate oven for eight or ten hours, it will be like cream in consistency, and delicious to the taste.

### *Flour-Ball.*

Tie up a quart of wheat-flour in a pudding-bag tightly. Put into a pot of boiling water and keep it boiling for ten or twelve hours. Take the hard mass out of the bag and allow it to dry before the fire. Peel off and throw away the thin outer portion, and grate down the mass with a nutmeg-grater into a powder, as wanted for use. One or two teaspoonfuls of this may be rubbed into a paste with some milk and then stirred into a pint of milk, over the fire. The milk should only be scalded ; that is, just brought to the boiling point without being boiled. This is a valuable article of food in diarrhœa, especially in children.

### *Egg-Broth.*

Mix two ounces of pearl-sago in half-pint of cold water, and let it stand half an hour. Then boil until it becomes smooth and sufficiently thick. Beat the yelks of four fresh eggs, with half a pint of cream ; then mix with the sago, and stir the whole well with a quart of beef-tea or chicken broth, just made, at a boiling heat

### *Caudle.*

Beat up a raw, fresh egg with a wineglassful of sherry-wine, and add to it half a pint of hot oatmeal, Indian meal, farina, or gruel. Flavor with lemon-peel nutmeg, and sugar.*

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* This and some of the preceding receipts are from "The Trained Nurse" in an article on "The Food of the Sick," by Henry Hartshorne, M.D., LL.D., of Philadelphia.

# TABLE OF DOSES.

| PREPARATION. | DOSE. |
|---|---|
| Absinthin | gr. ¼. |
| Absinthium | gr. xx—xl. |
| Acetanilid | gr. v—xv. |
| Acetum lobeliæ | ♏ x—fʒj. |
| opii | ♏ v—xx. |
| sanguinariæ | ♏ xv—xl. |
| scillæ | ♏ v—fʒj. |
| Acidum arsenosum | gr. 1-30—1-12. |
| benzoicum | gr. x—xxx. |
| boricum | gr. v—xxx. |
| camphoricum | gr. viij—ʒj. |
| carbolicum | gr. ss—ij. |
| citricum | gr. x—ʒss. |
| gallicum | gr. ii—x. |
| hydrobromicum dilutum | ♏ x—fʒiv. |
| hydrochloricum dilutum | ♏ x—xxx. |
| hydrocyanicum dilutum | ♏ i—v. |
| hypophosphorosum dilutum | ♏ x—xl. |
| lacticum | ♏ xx—fʒss. |
| nitricum dilutum | ♏ v—xx. |
| nitrohydrochloricum dilutum | ♏ v—xxx. |
| oxalicum | gr. ss. |
| phosphoricum dilutum | ♏ ii—xx. |
| picricum | gr. ¼—ij. |
| salicylicum | gr. x—ʒj. |
| sulphuricum aromaticum | ♏ x—xx. |
| dilutum | ♏ v—xv. |
| sulphurosum | ♏ v—fʒj. |
| tannicum | gr. i—xx. |
| tartaricum | gr. v—xx. |
| Aconitina | gr. 1-300-1-250 |
| Adhatoda justicia | gr. x. |
| Adonidin | gr. 1-20—1-5. |
| Æther aceticus | ♏ x—fʒj. |
| hydriodicus | ♏ v—xx. |
| hydrobromicus | fʒj. |
| valerianicus | ♏ ij. |
| Agaricin | gr. 1-12—j. |
| Agathin | gr. v—x. |
| Ailanthus | gr. v—x. |
| Alantol | gr. 1-6—1-3. |
| Aletris | gr. x. |
| Allyl tribromide | gtt. v. |
| Alnuin | gr. i—iij. |
| Alnus | gr. x—xl. |
| Aloe purificata | gr. i—xx. |
| Aloin | gr. 1-10—ij. |
| Alumen | gr. i—xx. |
| ammonio-ferricum | gr. ii—xx. |
| exsiccatum | gr. i—v. |
| Alumini hydras | gr. iii—xx. |
| Ambragrisea | gr. v—ʒj. |
| Ammonii benzoas | gr. ii—x. |
| boras | gr. iv. |
| bromidum | gr. x—xv. |
| carbonas | gr. ii—xx. |
| chloridum | gr. v—xx. |
| iodidum | gr. v—x. |
| phosphas | gr. iss—xx. |
| valerianas | gr. ii—v. |
| Ammonium embelate | gr. iii—vj. |
| Amyl nitris | ♏ ¼—j. |
| Amylene hydras | ♏ x—xxx. |
| Amylum iodatum | gr. x—ʒj. |
| Anemonin | gr. 1-10—ij. |
| Antimonii et potassii tartras | gr. 1-40—j. |
| oxidum | gr. ii—iij. |
| Antimonium sulphuratum | gr. i—iij. |
| Antinervin | gr. viii—xv. |
| Antipyrin | gr. v—xxx. |
| Antispasmine | gr. 1-10—iss. |
| Apiolinum | ♏ iii—vj. |
| Apocynum | gr. v—xx. |
| Apocodeine | gr. ¼—⅔. |
| Apomorphinæ hydrochloras | gr. 1-16—¼. |
| Aqua ammoniæ | ♏ ii—x. |
| amygdalæ amaræ | f℥ss. |
| anisi | f℥ss—j. |
| aurantii florum | f℥ss—j. |
| camphoræ | fʒi—iv. |
| chlori | fʒi—v. |

| PREPARATION. | DOSE. |
|---|---|
| Aqua chloroformi | fʒi—iv. |
| cinnamomi | f℥ss—iv. |
| creosoti | fʒss—iv. |
| fœniculi | fʒij—f℥j. |
| menthæ piperitæ | fʒj—f℥ij. |
| viridis | fʒj—f℥ij. |
| rosæ | f℥ss—ij. |
| Arasa | gr. xxx. |
| Arbutin | gr. ii—v. |
| Areca | ♏ v—xx. |
| Argenti cyanidum | gr. 1-40—1-20 |
| iodidum | gr. ⅛—¼. |
| nitras | gr. 1-6—½. |
| oxidum | gr. ss—ij. |
| Asafœtida | gr. x. |
| Asaprol | gr. v—x. |
| Asclepidin | gr. i—v. |
| Asparagin | gr. i—ij. |
| Aspidium | ʒss—iss. |
| Atropina | gr. 1-200-1-60. |
| Atropinæ sulphas | gr. 1-200-1 60. |
| Auri et sodii chloridum | gr. 1-50—1-10. |

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|---|---|
| Balsamum Canadense | ♏ v—x. |
| Peruvianum | ♏ v—xxx. |
| Tolutanum | gr. v—x. |
| Baptisin | gr. i—v. |
| Barii chloridum | gr. 1-20—½. |
| Beberinæ sulphas | gr. i—x. |
| Benzanilide | gr. v—xv. |
| Benzinum | ♏ x—xxx. |
| Benzo-naphthol | gr. v—ʒj. |
| Benzosol | gr. iv—xv. |
| Berberina | gr. ¼—v. |
| Berberinæ hydrochloras | gr. ¼—v. |
| Beta-naphthol bismuth | gr. xv—xxx. |
| Bismuthi citras | gr. i—v. |
| et ammoniæ citras | gr. i—v. |
| salicylas | gr. i—xx. |
| subcarbonas | gr. v—xx. |
| subnitras | gr. v—xx. |
| Bromamide | gr. x—xv. |
| Bromoform | ♏ v—x. |
| Bryonin | gr. 1-6—⅓. |

| | |
|---|---|
| Caffeina | gr. ii—x. |
| Caffeina citrata | gr. i—v. |
| Caffeina citrata effervescens | ʒi—iij. |
| sodio-benzoas | gr. ii—x. |
| sodio-salicylas | gr. ii—x. |
| Caffeine tri-iodide | gr. ii—iv. |
| Cajuputi oleum | ♏ i—v. |
| Calcii bromidum | gr. x—xx. |
| carbonas præcipitatus | gr. x—xl. |
| chloridum | gr. i—xx. |
| hypophosphis | gr. x—xx. |
| phosphas præcipitatus | gr. x—xxx. |
| salicylas | gr. viii—xx. |
| Calumba | gr. v—x. |
| Calx sulphurata | gr. ¼—ij. |
| Cambogia | gr. 1-10—iij. |
| Camphora | gr. i—ij. |
| monobromata | gr. i—v. |
| Cannabinæ tannas | gr. i—x. |
| Cannabinone | gr. ss—ij. |
| Capsicum | gr. i—xx. |
| Carbo animalis purificatus | gr. x—ʒj. |
| Cardamomum | gr. v—xv. |
| Carduus benedictus | ʒi—v. |
| Carota | gr. xxx—ʒj. |
| Carpaine hydrochlorate | gr. 1-12—⅓. |
| Carum | gr. x—xxx. |
| Cascarilla | gr. ii—xx. |
| Cascarin | gr. iss—xv. |
| Cassia fistula | ʒj. |
| Castor | gr. x—xx. |
| Catechu | gr. i—xxx. |
| Cathartic acid | gr. i—ij. |
| Caulophyllum | gr. xv—xl. |
| Cedron | gr. i—ij. |
| Cerii oxalas | gr. i—x. |

| PREPARATION. | DOSE. |
|---|---|
| Cetrarin | gr. i—ij. |
| Chaulmoogra-oil | ♏v—xx. |
| Chelidonium | gr. x—xl. |
| Chenopodium | gr. x—xl. |
| Chinoidinum | gr. iii—xxx. |
| Chinolina | gr. viii—xvj. |
| Chinolinæ salicylas | gr. v—xxx. |
| Chirata | gr. xv—xxx. |
| Chloral | gr. ii—xx. |
| butylicum | gr. ii—xxx. |
| Chloralamid | gr. xxx—xlv. |
| Chloralose | gr. iii—vj. |
| Chloroformum purificatum | ♏x—xx. |
| Chrysarobinum | gr. ⅛—xx. |
| Cimicifuga | gr. xx—xxx. |
| Cinchona | ʒi—iss. |
| Cinchonidinæ salicylas | gr. ii—x. |
| sulphas | gr. vi—xl. |
| Cinchonina | gr. v—xxx. |
| Cinchoninæ iodosulphas | gr. i—v. |
| sulphas | gr. v—xxx. |
| Cinnamomum | gr. x—xxx. |
| Cnicin | gr. v—x. |
| Cocainæ hydrochloras | gr. ¼—ij. |
| Codeina | gr. ¼—ij. |
| Colchicina | gr. 1-100--1-60. |
| Collinsonia Canadensis | gr. x—xl. |
| Colocynthis | gr. ii—v. |
| Confectio opii | gr. x—xx. |
| sennæ | ʒi—iij. |
| Coniina | ♏1-10—j. |
| Coniinæ hydrobromas | gr. 1-12—j. |
| Convallamarinum | gr. ¼—ij. |
| Convolvulin | gr. iss—iij. |
| Copaiba | ♏xx—fʒj. |
| Coriandrum | gr. v.—xxx. |
| Cornutin | gr. 1-48—1-24. |
| Coronilla | gr. v—xx. |
| Coronillin | gr. i—ix. |
| Coto | gr. v—xxx. |
| Cotoina | gr. ss—j. |
| Creolinum | ♏ii—v. |
| Creosol | gr. v—x. |
| Creosote calcium hydrochlorophosphate | gr. ss—ij. |
| Creosote carbonate | ♏xv—fʒj. |
| Creosotum | ♏i—iij. |
| Creta preparata | gr. x—xx. |
| Crocus | gr. x—xx. |
| Cubeba | gr. xx—ʒij. |
| Cupreine hydrochlorate | gr. xv—xxx. |
| Cupri acetas | gr. 1-10. |
| arsenis | gr. 1-40—j. |
| sulphas | gr. 1-6—ij. |
| Cuprohæmol | gr. iss—ij. |
| Cuprum ammoniatum | gr. 1-6—j. |
| Curare | gr. 1-20—1-3. |
| Cypripedium | gr. xv—xxx. |
| Daturina | gr. 1-120. |
| Decoctum aloës compositum | f℥ss—ij. |
| apocyni | f℥i—ij. |
| azedarach | f℥ss. |
| cetrariæ | f℥i—iv. |
| cimicifugæ | fʒvj—f℥iss. |
| dioscoreæ | f℥i—iv. |
| euphorbiæ piluliferæ | f℥ij. |
| granati | f℥iv—vj. |
| hæmatoxyli | f℥i—ij. |
| quillaiæ | fʒi—ij. |
| decoctum rumicis | f℥i—iv. |
| sarsaparillæ compositum | f℥i—iv. |
| uvæ ursi | f℥ss—ij. |
| Delphinine | gr. 1-10—1-8. |
| Dermatol | gr. x—xv. |
| Digitalinum | gr. 1-60—1-30. |
| Digitalis | gr. ss—ij. |
| Digitoxin | gr. 1-64—1-48. |
| Dita | ʒi—iv. |
| Diuretin | gr. xv. |
| Dracontium | gr. x—ʒj. |
| Duboisinæ hydrobromas | gr. 1-150--1-30. |
| sulphas | gr. 1-150--1-30. |
| Dulcin | gr. i—v. |
| Elaterinum | gr. 1-20—1-12. |
| Embelia ribes | ʒi—iv. |
| Emetina | gr. 1-120—¼. |
| Emulsum ammoniaci | fʒi—iv. |
| amygdalæ | fʒij—f℥ss. |
| Ephedrine | gr. ii—vij. |
| Epigæa | ʒss—ij. |
| Ergota | gr. x—ʒj. |
| Ergotinum | gr. i—v. |

| PREPARATION. | DOSE. |
|---|---|
| Erigerontis oleum | ♏xx—xxx. |
| Eschscholtzia | gr. xxx. |
| Ethylene bromide. | gtt. iii—viij. |
| Eucalypteol | gr. ss—iij. |
| Eucalyptol | ♏v—xxx. |
| Eugenol | ♏v—xv. |
| Eupatorium | gr. xv—ʒj. |
| Euphorbia corollata | gr. xv—xx. |
| Euphorin | gr. iii—vj. |
| Europhen | gr. v—x. |
| Exalgine | gr. i—vj. |
| Extractum aconiti | gr. ¼—½. |
| aconiti fluidum | ♏1-10—j. |
| æsculi hippocas tani fluidum | ♏xx—fʒj. |
| agarici | gr. iii—vj. |
| ailanthi glandulosæ fluidum | ♏x—fʒj. |
| alnus fluidum | ♏x—xl. |
| aloës | gr. [illegible]—v. |
| liquidum | ♏v—xl. |
| apocyni fluidum | ♏v—xxx. |
| arnicæ radicis | gr. i—ij. |
| fluidum | ♏v—xx. |
| aromaticum fluidum | fʒss—j. |
| asclepiadis fluidum | ♏xv—ʒj. |
| aspidospermatis fluidum | fʒss—j. |
| azedarach fluidum | fʒj. |
| baptisiæ | gr. i—ix. |
| belladonnæ foliorum alcoholicum | gr. 1-40—j. |
| radicis fluidum | ♏1-10—ij. |
| berberidis fluidum | ♏x—xxx. |
| bryoniæ fluidum | ♏v—xv. |
| buchu fluidum | ♏x—fʒj. |
| calami fluidum | ♏xv—fʒj. |
| calumbæ | gr. ss—ij. |
| fluidum | ♏xv—xxx. |
| camelliæ fluidum | ♏x—fʒj. |
| cannabis Indicæ | gr. ss. |
| fluidum | ♏i—xx. |
| capsici fluidum | ♏i—v. |
| cardamomi compositum fluidum | ♏xv. |
| cardui fluidum | ♏xv—fʒj. |
| cascaræ amargæ fluidum | fʒss—j. |
| cascarillæ fluidum | ♏ii—xx. |
| castaneæ fluidum.. | fʒi—ij. |
| caulophylli fluidum | ♏xv—xl. |
| chekan fluidum | fʒi—ij. |
| chelidonii | gr. x. |
| chimaphilæ fluidum | ♏xx—xl. |
| chinæ fluidum | fʒss—j. |
| chiratæ fluidum | ♏x—xxx. |
| chopparo amargoso fluidum | fʒss—f℥ss. |
| cimicifugæ | gr. i--v. |
| fluidum | fʒss. |
| cinchonæ | gr. i—x. |
| fluidum | ♏x—fʒij. |
| cocæ | gr. iii—xv. |
| fluidum | ♏x—ʒj. |
| cocculi fluidum | ♏i—ij. |
| cocillanæ fluidum | ♏x—xx. |
| coffeæ viridis fluidum | fʒss—ij. |
| colchici radicis | gr. ss—ij. |
| fluidum | ♏ii—iv. |
| seminis fluidum | ♏ii—v. |
| collinsoniæ fluidum | ♏x—fʒj. |
| colocynthidis | gr. ii—iij. |
| compositum | gr. iv—x. |
| conii | gr. ss—ij. |
| fluidum | ♏i—v. |
| convallariæ | gr. v—xx. |
| fluidum | fʒss—j. |
| coptidis fluidum... | fʒss—j. |
| coriandri fluidum | ♏x—xxx. |
| cornus fluidum | fʒss—j. |
| Floridæ | gr. i—v. |
| corydalis fluidum | ♏xv—fʒj. |
| coto corticis fluidum | ♏xii—xxx. |
| cubebæ fluidum | ♏x—xxx. |
| cusso fluidum | ♏xx—fʒij. |
| cypripedii | gr. i—v. |
| fluidum.... | ♏x—xx. |
| damianæ | gr. v—xv. |
| fluidum | fʒss—iv. |
| digitalis | gr. ¼—½. |
| fluidum | ♏ss—ij. |
| dioscoreæ fluidum | ♏v—xxx. |
| droseræ fluidum | ♏v—xv. |
| duboisiæ | gr. 1-6—½. |
| fluidum | ♏x—xx. |
| dulcamaræ | ♏v—x. |
| fluidum | ♏xxx—fʒj. |
| emboliæ fluidum | fʒi—iv. |
| ephedræ fluidum | fʒi—ij. |
| ergotæ | gr. v—x. |

| Preparation. | Dose. |
|---|---|
| Extractum ergotæ fluidum | ♏x—fʒij. |
| eriodictyi | gr. iii—xv. |
| fluidum | ♏xv—xxx. |
| eucalypti fluidum | ♏v—fʒj. |
| euonymi | gr. i—v. |
| eupatorii fluidum | ♏xxx—fʒj. |
| euphorbiæ piluliferæ | gr. i—ij. |
| fluidum | ♏xxx—fʒj. |
| fabianæ fluidum | ♏xv—xl. |
| frangulæ | gr. iii—viij. |
| fluidum | fʒss—j. |
| frankeniæ fluidum | ♏x—xv. |
| fraseræ fluidum | ♏xxx—fʒj. |
| galii fluidum | fʒi—ij. |
| garryæ | gr. ss—j. |
| fluidum | ♏x—xxx. |
| gelsemii fluidum | ♏ii—x. |
| gentianæ | gr. iii—xv. |
| fluidum | ♏xxx—fʒj. |
| geranii | gr. i—v. |
| fluidum | ♏xxx—fʒj. |
| gei fluidum | ♏xx—fʒj. |
| gilleniæ (trifoliatæ) fluidum | ♏v—xxx. |
| glycyrrhizæ fluidum | ♏xx—fʒj. |
| purum | gr. v—ʒj. |
| gossypii radicis fluidum | fʒss—j. |
| granati fluidum | fʒi—ij. |
| grindeliæ | gr. i—v. |
| fluidum | ♏x—fʒj. |
| guaranæ fluidum | ♏x—fʒj. |
| hæmatoxyli | gr. v—x. |
| hamamelidis fluidum | ♏x—fʒj. |
| helianthemi fluidum | fʒi—ij. |
| helianthi | gr. xv—ʒiss. |
| helonias fluidum | ♏xx—xxx. |
| hemidesmi fluidum | fʒss—j. |
| hepaticæ fluidum | fʒss—iss. |
| hoang-nan fluidum | ♏v—xxx. |
| humuli | gr. v. |
| hydrangeæ fluidum | ♏xxx—fʒj. |
| hydrastis | gr. ii—v. |
| fluidum | ♏v—xxx. |
| hyoscyami | gr. 1-6—j. |
| fluidum | ♏i—v. |
| ignatiæ | gr. 1-6—½. |
| fluidum | ♏i—ij. |
| ipecacuanhæ fluidum | ♏i—iij. |
| iridis | gr. ¼—j. |
| fluidum | ♏xxx—fʒj. |
| jalapæ | gr. ii—v. |
| jambolanum fluidum | ♏v—x. |
| juglandis | gr. v—xxx. |
| fluidum | fʒi—ij. |
| juniperi fructus fluidum | fʒss—iss. |
| kino liquidum | ♏xv—xxx. |
| krameriæ | gr. i—ix. |
| fluidum | ♏i—xx. |
| lactucarii fluidum | ♏x—fʒj. |
| lappæ fluidum | ♏xv—fʒj. |
| leonuri fluidum | fʒi—ij. |
| leptandræ | gr. iii—x. |
| fluidum | fʒss—j. |
| linderæ fluidum | ♏xxx—fʒj. |
| lippiæ fluidum | ♏v—xxx. |
| lobeliæ fluidum | ♏i—x. |
| lupulini fluidum | ♏v—xv. |
| lycopi fluidum | fʒi—iv. |
| magnoliæ fluidum | ♏xxx—fʒj. |
| maidis stigmatorum fluidum | fʒi—ij. |
| malti | fʒi—iv. |
| diastasicum | fʒj—f℥ij. |
| manaceæ fluidum | ♏v—xx. |
| mango fluidum | fʒss—j. |
| manzanitæ fluidum | fʒss—ij. |
| marrubri fluidum | fʒi—ij. |
| matico | gr. ii—xij. |
| fluidum | ♏xx—fʒij. |
| matricariæ fluidum | fʒi—iij. |
| melissæ fluidum | fʒi—ij. |
| menispermi fluidum | fʒss—j. |
| methystici fluidum | ♏xv—fʒss. |
| mitchellæ fluidum | fʒss—j. |
| myricæ fluidum | fʒss—j. |
| nucis vomicæ | gr. ¼—½. |
| fluidum | ♏i—v. |
| opii | gr. ¼—½. |
| origani fluidum | fʒss—j. |
| orthosiphon fluidum | ♏xx—xxx. |
| pancreatis | gr. i—v. |
| pareiræ fluidum | fʒss—j. |
| physostigmatis | gr. 1-6—iv. |
| phytolaccæ radicis fluidum | ♏v—fʒj. |
| pilocarpi fluidum | ♏x—fʒj. |

| Preparation. | Dose. |
|---|---|
| Extractum pimentæ fluidum | ♏viii—xl. |
| pimpinellæ fluidum | ♏xv—fʒss. |
| piscidiæ | gr. ii—x. |
| fluidum | fʒss—ij. |
| plantago fluidum | ♏v—fʒj. |
| podophylli | gr. ii—iv. |
| fluidum | ♏i—xxx. |
| polygonati fluidum | ♏v—xv. |
| polygoni fluidum | ♏x—fʒj. |
| polytrichii fluidum | fʒi—ij. |
| populi fluidum | fʒss—j. |
| prinos fluidum | fʒss—j. |
| pruni Virginianæ fluidum | ♏x—fʒj. |
| pteleæ fluidum | ♏viii—xxx. |
| pulsatillæ fluidum | ♏i—v. |
| quassiæ | gr. i—v. |
| fluidum | ♏v—xx. |
| quercus albæ fluidum | fʒss—j. |
| quillaiæ fluidum | ♏xv—fʒss. |
| rhamni catharticæ fructus fluidum | fʒi—iss. |
| purshianæ fluidum | ♏xv—fʒj. |
| rhei | gr. ii—x. |
| fluidum | ♏x—fʒj. |
| rhœados fluidum | ♏xxx—fʒiss. |
| rhois aromaticæ fluidum | ♏v—fʒiss. |
| glabræ fluidum | fʒi—ij. |
| toxicodendri fluidum | ♏i—v. |
| rosæ fluidum | ♏v—fʒj. |
| rubi fluidum | fʒss. |
| rumicis fluidum | fʒss—j. |
| sabal fluidum | fʒss—ij. |
| sabbatiæ fluidum | fʒss—j. |
| sabinæ fluidum | ♏v—xx. |
| salviæ fluidum | fʒss—ij. |
| sanguinariæ fluidum | ♏v—xv. |
| santonicæ | gr. ii—viij. |
| fluidum | ♏viii—xxx. |
| sarsaparillæ | gr. v—xxx. |
| fluidum | fʒss—ij. |
| compositum | ♏vii—xxx. |
| scillæ fluidum | ♏i—v. |
| scoparii fluidum | fʒss—j. |
| scutellariæ fluidum | fʒss—j. |
| sedi acris fluidum | ♏xv—xxx. |
| senegæ fluidum | ♏x—xx. |
| sennæ | ʒi—iv. |
| fluidum | ♏xxx—fʒiv. |
| deodoratum | fʒi—iv. |
| serpentariæ fluidum | ♏x—xxx. |
| simulo fluidum | ♏xx—fʒj. |
| solani paniculati fluidum | ♏x—xxx. |
| spigeliæ fluidum | fʒi—ij. |
| stillingiæ fluidum | ♏x—fʒj. |
| compositum | fʒi—ij. |
| stramonii seminis | gr. ¼—½. |
| fluidum | ♏i—v. |
| taraxaci | gr. x—xl. |
| fluidum | fʒi—ij. |
| teucrii fluidum | fʒi—ij. |
| thujæ fluidum | fʒss—j. |
| tongæ fluidum | ♏xx—fʒj. |
| trifolii fluidum | fʒi—ij. |
| trillii fluidum | fʒi—ij. |
| tritici fluidum | fʒi—iv. |
| tussilago fluidum | fʒi—ij. |
| uvæ ursi | gr. v—xv. |
| fluidum | fʒss—j. |
| valerianæ fluidum | fʒss—j. |
| veratri viridis fluidum | ♏i—xl. |
| viburni opuli fluidum | fʒi—ij. |
| prunifolii | gr. iii—x. |
| fluidum | ♏xv—fʒj. |
| violæ fluidum | fʒss—ij. |
| visci fluidum | ♏x—fʒj. |
| xanthii fluidum | fʒi—ij. |
| xanthoxyli fluidum | fʒss—j. |
| zingiberis fluidum | ♏i—xx. |
| | |
| Fel bovis inspissatum | gr. v—viij. |
| purificatum | gr. iii—vj. |
| Fermentum | f℥ss—j. |
| Ferratin | gr. iv—viij. |
| Ferri albuminas | gr. v—xxx. |
| arsenias | gr. 1-20—1-10. |
| carbonas saccharatus | gr. ii—x. |
| citras | gr. v—xv. |
| et ammoniæ citras | gr. iii—v. |
| sulphas | gr. iii—v. |
| tartras | gr. v—xx. |
| potassii tartras | gr. v—xv. |
| quininæ citras | gr. iii—v. |
| citras solubilis | gr. iii—x. |

| Preparation. | Dose. |
|---|---|
| Ferri et strychninæ citras | gr. i—iij. |
| ferrocyanidum | gr. iii—vj. |
| hypophosphis | gr. v—x. |
| iodidum saccharatum | gr. v—xx. |
| lactas | gr. ii—v. |
| oxalis | gr. ii—v. |
| phosphas | gr. v—x. |
| pyrophosphas | gr. ii—v. |
| sulphas | gr. i—v. |
| exsiccatus | gr. i—iij. |
| præcipitatus | gr. i—ij. |
| valerianas | gr. i—iij. |
| Ferripyrin | gr. iv—viij. |
| Ferrohæmol | gr. viij. |
| Ferrum dialysatum | ♏x—xxx. |
| reductum | gr. i—v. |
| Fuchsin | gr. ¼—j. |
| Galega | ʒi—iss. |
| Gelsemium | gr. ii—xx. |
| Gentiana | gr. viii—xxx. |
| Geranium | gr. xv—ʒj. |
| Gillenia | gr. v—xxx. |
| Glycerinum | fʒi—iv. |
| Glyceritum lactucarii | fʒii—iij. |
| pepsini vitulini | ♏xxx—fʒj. |
| Glycerolum pepsini | ♏ii—x. |
| Glycyrrhiza | gr. v—ʒss. |
| Granatum | ʒi—ij. |
| Guaiaci resina | gr. v—xv. |
| Guaiacol | ♏i—v. |
| carbonate | gr. v—viij. |
| di-iodide | gr. i—v. |
| Gurjun-oil | ♏x—ʒij. |
| Gynocardic acid | gr. ss—iij. |
| Hæmoferrum | gr. iij. |
| Hæmogallol | gr. ii—viij. |
| Hæmol | gr. ii—viij. |
| Hazeline | ♏x—fʒij. |
| Helenin | gr. 1-6. |
| Helleborein | gr. 1-10—¼. |
| Helleborus | gr. iv—xv. |
| Helonias | gr. xv. |
| Heuchera | gr. xxx. |
| Homatropinæ hydrobromas | gr. 1-120--1-20. |
| Hydrargyri chloridum corrosivum | gr. 1-30—1-10. |
| mite | gr. 1-20—x. |
| cyanidum | gr. 1-100--1-82. |
| formamidatum | gr. 1-6. |
| iodidum rubrum | gr. 1-50—1-10. |
| viride | gr. ⅓. |
| oxidum rubrum | gr. 1-50—1-10. |
| salicylas | gr. 1-12—⅛. |
| subsulphas flavus | gr. ii—v. |
| tannas | gr. ss—j. |
| Hydrargyrum cum creta | gr. ss—x. |
| Hydrastina | gr. ss—v. |
| hydrochloras | gr. ss—v. |
| Hydrastininæ hydrochloras | gr. ss—ij. |
| Hydrocotyle | ℥j. |
| Hyoscinæ hydrobromas | gr. 1-100. |
| Hyoscyaminæ hydrobromas | gr. 1-60—1-32. |
| sulphas | gr. 1-60—1-32. |
| Hyoscyamus | gr. v—x. |
| Hypnal | ♏xv—xxx. |
| Hypnone | ♏v—x. |
| Hyssopus | gr. ii—v. |
| Ignatia | gr. i—ij. |
| Infusum aletris | f℥ss. |
| asclepias | f℥i—ij. |
| brayeræ | f℥iv—viij. |
| buchu | f℥ij. |
| camelliæ | f℥ii—vj. |
| capsici | fʒij—f℥ss. |
| caryophylli | f℥i—ij. |
| castaneæ | fʒii—iv. |
| cinchonæ | f℥ss—iij. |
| collinsoniæ | f℥i—iv. |
| convallariæ | f℥ss—ij. |
| digitalis | fʒi—iv. |
| eupatorii | f℥ii—iv. |
| gentianæ compositum | f℥ss—j. |
| humuli | f℥ii—v. |
| juniperi | f℥ii—iv. |
| morreniæ | f℥ss. |
| petroselini | f℥ss—ij. |
| pilocarpi | fʒij—f℥iv. |
| pruni Virginianæ | f℥i—iv. |
| quassiæ | fʒi—ij. |
| sassafras | fʒii—viij. |
| sennæ | f℥i—v. |

| Preparation. | Dose. |
|---|---|
| Infusum sennæ compositum | f℥i—iiss. |
| taraxaci | f℥i—ij. |
| teucrii | f℥i—ij. |
| Ingluvin | gr. v—xx. |
| Inula | gr. xv—ʒj. |
| Inulin | gr. i—ij. |
| Iodantifebrin | gr. ii—viij. |
| Iodantipyrin | gr. ss—ij. |
| Iodoformum | gr. ii—v. |
| Iodol | gr. ¼—v. |
| Iodophenin | gr. ss—ij. |
| Iodum | gr. ss—j. |
| Ipecacuanha | gr. ss—x. |
| Iridin | gr. ss—iij. |
| Iron quinine chloride | gr. iss—iij. |
| Jalapa | gr. viii—xx. |
| Jambol | gr. v—x. |
| Juglans | ʒi—ij. |
| Kamala | ʒi—ij. |
| Kava-kava | ♏xv—fʒss. |
| Kino | gr. x—xx. |
| Kola-nut | gr. v—ʒij. |
| Kosin | gr. v—xx. |
| Koussein | gr. xv—ʒj. |
| Krameria | gr. v—xx. |
| Lactonaphthol | gr. ii—v. |
| Lactophenin | gr. viii—xv. |
| Lactucarium | gr. x—xx. |
| Lactucin | gr. i—ij. |
| Ledum | gr. xv—xxx. |
| Leptandra | gr. xx. |
| Liquor acidi arseniosi | ♏i—x. |
| ammonii acetatis | fʒi—iv. |
| arseni chloridi | ♏i—x. |
| arseni et hydrargyri iodidi | ♏i—x. |
| calcis | f℥ss—ij. |
| ferri acetatis | ♏ii—x. |
| chloridi | ♏ii—x. |
| citratis | ♏x—xl. |
| et ammonii acetatis | fʒi—iv. |
| et quininæ citratis | ♏v—xv. |
| malatis | fʒss—ij. |
| nitratis | ♏x—xx. |
| subsulphatis | ♏ii—x. |
| hypophosphitum acidus | fʒi—iv. |
| iodi compositus | ♏v—xx. |
| magnesii citratis | f℥iv—xvj. |
| mangano-ferri peptonatus | fʒij—f℥ss. |
| pancreaticus | fʒi—iv. |
| pepsinæ | f℥ss. |
| phosphori | fʒj. |
| potassæ | ♏x—xx. |
| potassii arsenitis | ♏i—x. |
| citratis | f℥ss. |
| sodæ | ♏v—x. |
| chloratæ | fʒss—j. |
| sodii arseniatis | ♏iii—v. |
| Lithii benzoas | gr. v—xx. |
| bromidum | gr. v—xx. |
| carbonas | gr. v—xx. |
| citras | gr. v—xx. |
| effervescens | ʒi—ij. |
| guaiacas | gr. i—v. |
| iodidum | gr. i—v. |
| salicylas | gr. v—xx. |
| Lobelina | gr. ss—j. |
| Lupulinum | gr. v—xx. |
| Lycetol | gr. iv—viij. |
| Macrotin | gr. ss—ij. |
| Magnesia | ʒi—iv. |
| ponderosa | ʒss—iv. |
| Magnesii carbonas | ʒss—ij. |
| citras granulatis | ʒi--iv. |
| sulphas | ʒj—℥j. |
| sulphis | gr. xv—xxx. |
| sulphocarbolas | gr. xv—xxx. |
| Malakine | gr. v—xv. |
| Mangani dioxidum | gr. ii—x. |
| sulphas | gr. ii—v. |
| Manna | ℥j. |
| Massa copaibæ | gr. x—ʒss. |
| ferri carbonatis | gr. iii—v. |
| hydrargyri | gr. ss--xij. |
| Matico | gr. xxx--ʒj. |
| Menispermum | gr. v—xx. |
| Menthol | gr. i—v. |
| Methyl salicylas | ♏i—v. |
| Methylal | fʒi—ij. |
| **Methylene bichloride** | **♏v—xx.** |

| PREPARATION. | DOSE. |
|---|---|
| Methylene blue | gr. ii—v. |
| Mezereum | gr. x. |
| asafœtidæ | f℥ss—j. |
| cretæ | fʒi—iv. |
| chloroformi | fʒi—iv. |
| ferri composita | fʒii—iv. |
| glycyrrhizæ composita | fʒj—f℥ss. |
| magnesiæ et asafœtidæ | fʒss—iv. |
| potassii citratis | fʒii—iv. |
| rhei et sodæ | fʒj—f℥j. |
| Monesia | gr. x—xx. |
| Morphina | gr. 1-10—½. |
| Morphinæ acetas | gr. 1-6—½. |
| hydrochloras | gr. 1-6—½. |
| sulphas | gr. 1-6—½. |
| Morrhuæ oleum | fʒj—f℥ss. |
| Morrhuol | ♏xv—xl. |
| Moschus | gr. v—viij. |
| Muscarina | gr. ⅛—ij. |
| Muscarinæ nitras | gr. 1-12—j. |
| Myrica | gr. xx—xxx. |
| Myristica | gr. v—xx. |
| Myrrha | gr. ii—xxx. |
| Myrtol | gr. iv. |
| Napelline | gr. ss. |
| Naphthalinum | gr. i—x. |
| Naphthol-alpha | gr. ss—v. |
| beta | gr. ss—v. |
| Nicotina | ♏1-30—1-10. |
| Oleoresina aspidii | fʒss—ij. |
| capsici | ♏1-20—ij. |
| cubebæ | ♏v—xxx. |
| lupulini | gr. ii—v. |
| piperis | ♏¼—j. |
| Oleum amygdalæ amaræ | ♏¼—j. |
| expressum | fʒij—f℥ss. |
| anisi | ♏v—x. |
| anthemidis | ♏ii—viij. |
| betulæ volatile | ♏i—v. |
| camphoræ | ♏i—iij. |
| cari | ♏i—v. |
| caryophylli | ♏i—vj. |
| chenopodii | ♏v—xx. |
| cinnamomi | ♏i—iij. |
| copaibæ | ♏v—x. |
| coriandri | ♏i—v. |
| cubebæ | ♏v—xij. |
| curcas | ♏i—v. |
| eucalypti | ♏iii—xx. |
| fœniculi | ♏v—xv. |
| gaultheriæ | ♏ii—xx. |
| hedeomæ | ♏ii—x. |
| juniperi | ♏v—xx. |
| lavandulæ | ♏iii—v. |
| florum | ♏iii—v. |
| menthæ piperitæ | ♏i—v. |
| viridis | ♏ii—v. |
| myristicæ | ♏i—v. |
| phosphoratum | ♏i—v. |
| pimentæ | ♏iii—v. |
| rosmarini | ♏i—v. |
| sabinæ | ♏ii—v. |
| sassafras | ♏i—iv. |
| terebinthinæ | ♏v—xv. |
| thymi | ♏i—ij. |
| tiglii | ♏¼—ij. |
| Opii pulvis | gr. ss—j. |
| Opium | gr. ¼—iij. |
| denarcotisatum | gr. ss—j. |
| Pambotano | ℥i—ij. |
| Pancreatini pulvis | gr. v—x. |
| Pancreatinum | gr. i—v. |
| Papain | gr. i—v. |
| Paraldehyde | ♏xx—fʒij. |
| Pepo | ʒi—ij. |
| Pepsinum in lamellis | gr. i—ij. |
| saccharatum | gr. v—xxx. |
| Petroselinum | gr. xxx—ʒij. |
| Phenacetin | gr. ii—viij. |
| Phenocollum hydrochloricum | gr. viii—xx. |
| Phenol-bismuth | gr. v—x. |
| Phosphorus | gr. 1-150-1-12. |
| Physostigminæ hydrobromas | gr. 1-60—1-20. |
| salicylas | gr. 1-64—1-20. |
| sulphas | gr. 1-60—1-20. |
| Phytolaccæ radicis pulvis | gr. i—v. |
| Pilocarpinæ hydrochloras | gr. 1-12—⅓. |
| Pilocarpus | gr. x—ʒj. |
| Pilulæ aloës | 1 to 5 pills. |
| et asafœtidæ | 1 to 5 " |

| PREPARATION. | DOSE. |
|---|---|
| Pilulæ aloës et ferri | 1 to 3 pills. |
| et mastiches | 1 to 5 " |
| et myrrhæ | 3 to 5 " |
| antimonii compositæ | 1 to 2 " |
| asafœtidæ | 1 to 4 " |
| catharticæ compositæ | 1 to 3 " |
| ferri carbonatis | 2 to 5 " |
| compositæ | 2 to 4 " |
| iodidi | 2 to 4 " |
| galbani compositæ | 2 to 3 " |
| opii | 1 pill. |
| phosphori | 1 to 5 pills. |
| rhei | 1 to 3 " |
| compositæ | 1 to 3 " |
| Pimenta | gr. x—xl. |
| Piper | gr. ii—xv. |
| Piperazin | gr. v—viij. |
| Piperina | gr. ss—x. |
| Plumbi acetas | gr. i—iv. |
| iodidum | gr. 1-12—¼. |
| Podophyllotoxin | gr. 1-10—1-6. |
| Potassa sulphurata | gr. ii—viij. |
| Potassii acetas | gr. x—ʒj. |
| bicarbonas | gr. v—xxx. |
| bichromas | gr. 1-5. |
| bitartras | gr. xx—ʒiv. |
| bromidum | gr. x—ʒj. |
| carbonas | gr. ii—xx. |
| chloras | gr. ii—x. |
| citras | gr. x—xl. |
| effervescens | ʒss—iss. |
| cyanidum | gr. 1-12—j. |
| et sodii tartras | gr. xx—ʒiv. |
| ferrocyanidum | gr. x. |
| hypophosphis | gr. ii—xxx. |
| iodidum | gr. v—ʒj. |
| nitras | gr. ii—xx. |
| sulphas | gr. xx—ʒij. |
| sulphis | gr. v—ʒj. |
| tartras | gr. v—xx. |
| Prinos | ʒss. |
| Pulvis aloës et canellæ | gr. xx. |
| antimonialis | gr. i—x. |
| aromaticus | gr. v—xxx. |
| cretæ aromaticus cum opio | gr. x—xx. |
| compositus | gr. v—xxx. |
| extracti piscidiæ | gr. ii—x. |
| viburni | gr. iii—x. |
| glycyrrhizæ compositus | ʒi—ij. |
| ipecacuanhæ et opii | gr. ii—x. |
| jalapæ compositus | gr. x—ʒj. |
| morphinæ compositus | gr. v—xv. |
| pancreatini | gr. v—x. |
| rhei compositus | ʒss—j. |
| Quassia | gr. x—xxx. |
| Quassin | gr. 1-30—⅓. |
| Quebrachine hydrochlorate | gr. i—ij. |
| Quillaiæ pulvis | gr. x—xxx. |
| Quinethyline sulphate | gr. vi—xij. |
| Quinetum | gr. j—ʒj. |
| Quinidinæ sulphas | gr. v—xxx. |
| Quinina | gr. j—ʒj. |
| Quininæ bisulphas | gr. i—xv. |
| hydrobromas | gr. i—xx. |
| hydrochloras | gr. i—xv. |
| carbamidata | gr. i—x. |
| sulphas | gr. j—ʒj. |
| valerianas | gr. i—xx. |
| Quinopropyline sulphate | gr. iv—viij. |
| Resorcinum | gr. x—ʒj. |
| Rheum | gr. i—xx. |
| Ricini oleum | fʒj—f℥j. |
| Rubidii et ammonii bromidum | gr. v—xx. |
| iodidum | gr. v. |
| Rutæ oleum | ♏ii—v. |
| Salacetol | gr. xxx—xlv. |
| Sal bromalide | gr. v—viij. |
| Salicinum | gr. x—ʒij. |
| Salicylamide | gr. iii—v. |
| Salinaphthol | gr. iii—viij. |
| Salipyrin | gr. xv—xxx. |
| Salix | ʒj. |
| Salocoll | gr. xv—xxx. |
| Salol | gr. v—ʒj. |
| Salophen | gr. v—xv. |
| Sanguinaria | gr. ii—xx. |
| Santali oleum | ♏v—x. |
| Santonica | ʒss—j. |
| Santoninoxime | gr. iii—xij. |
| Santoninum | gr. i—iv. |

| PREPARATION. | DOSE. |
|---|---|
| Saponinum | gr. ss—ij. |
| Scammonium | gr. v—xv. |
| Scilla | gr. ii—iij. |
| Scoparin | gr. viii—xv. |
| Sedum acre | ʒss—j. |
| Senega | gr. x—xx. |
| Senegin | gr. ss—ij. |
| Senna | ʒi—iiss. |
| Serpentaria | gr. x—ʒj. |
| Sodii acetas | gr. xv—ʒj. |
| arsenias | gr. 1-12—⅓. |
| benzoas | gr. x—xx. |
| bicarbonas | gr. v—xl. |
| bisulphis | gr. x—ʒss. |
| boras | gr. x—xl. |
| bromidum | gr. xx—ʒj. |
| carbonas | gr. v—xx. |
| exsiccatus | gr. v—xx. |
| chloras | gr. ii—x. |
| chloridum | gr. v—xl. |
| hypophosphis | gr. x—xx. |
| hyposulphis | gr. x—xx. |
| iodidum | gr. x—xl. |
| nitras | ʒi—ij. |
| nitris | gr. i—iij. |
| phosphas | gr. v—℥j. |
| pyrophosphas | gr. v—xl. |
| salicylas | gr. v—ʒj. |
| santoninas | gr. ii—x. |
| sulphas | ℥ss—j. |
| sulphis | gr. ss—ʒj. |
| sulphocarbolas | gr. ii—v. |
| Sodium and silver hyposulphite | gr. ¾—iij. |
| cresotate | ʒiss—ij. |
| paracresotate | gr. v—xv. |
| tellurate | gr. 1-12—1-3. |
| Solanine | gr. ¼—¾. |
| Solidago | gr. xxx—ʒij. |
| Somnal | ♏xx—fʒss. |
| Sparteinæ sulphas | gr. ss—ij. |
| Spigelia | ʒi—ij. |
| Spiritus ætheris compositus | fʒss—ij. |
| nitrosi | fʒi—ij. |
| ammoniæ | ♏v—xv. |
| aromaticus | fʒss—ij. |
| anisi | fʒi—ij. |
| camphoræ | ♏v—xx. |
| chloroformi | fʒss—j. |
| cinnamomi | fʒi—ij. |
| fœniculi | fʒss—j. |
| glonoini | ♏j. |
| juniperi | fʒj—f℥j. |
| compositus | fʒii—iv. |
| lavandulæ | fʒss—j. |
| menthæ piperitæ | ♏x—fʒj. |
| menthæ viridis | ♏v—x. |
| myristicæ | fʒi—ij. |
| rosmarini | ♏i—v. |
| Staphisagria | gr. i—iij. |
| Stramonii folia | gr. i—v. |
| semen | gr. ss—ij. |
| Strontii bromidum | gr. x—xx. |
| iodidum | gr. x—xx. |
| lactas | gr. x—xx. |
| Strophanthin | gr. 1-100—1-60. |
| Strychnina | gr. 1-60—1-20. |
| Strychninæ nitras | gr. 1-100—1-60. |
| sulphas | gr. 1-60—1-12. |
| Styrax | gr. v—xx. |
| Succus conii | fʒss—ij. |
| Sulphonal | gr. xv—xl. |
| Sulphur lotum | ʒss—℥ss. |
| præcipitatum | gr. xxx—ʒij. |
| sublimatum | gr. xx—ʒj. |
| Sulphuris iodidum | gr. ss—j. |
| Syrupus acidi hydriodici | ♏xxx—f℥ss. |
| allii | ♏x—fʒj. |
| cepæ | fʒi—iv. |
| amygdalæ | fʒii—iv. |
| calcii lactophosphatis | fʒi—ij. |
| calcis | fʒss—j. |
| ferri bromidi | ♏x—fʒj. |
| iodidi | ♏v—xxx. |
| quininæ et strychninæ phosphatum | fʒi—iv. |
| hypophosphitum | fʒss—ij. |
| compositus | fʒj—f℥j. |
| hypophosphitum cum ferro | fʒj—f℥j. |
| ipecacuanhæ | fʒi—ij. |
| krameriæ | fʒi—iv. |
| lactucarii | fʒj—f℥iss. |
| maidis stigmatorum | f℥ss—j. |
| papaveris | fʒss—f℥j. |
| phosphatum compositus | fʒi—ij. |

| PREPARATION. | DOSE. |
|---|---|
| Syrupus picis liquidæ | fʒi—ij. |
| pruni Virginianæ | fʒi—iv. |
| rhamni catharticæ | fʒi—ij. |
| rhei | ʒj. |
| aromaticus | f℥ss. |
| rhœados | fʒi—ij. |
| rubi | fʒii—iv. |
| aromaticus | fʒi—iv. |
| sarsaparillæ compositus | fʒss—iv. |
| scillæ | ♏x—fʒj. |
| compositus | ♏x—fʒj. |
| senegæ | fʒi—ij. |
| sennæ | fʒi—iv. |
| tolutanus | f℥ss. |
| stillingiæ compositus | fʒj—f℥j. |
| trifolii compositus | fʒi—iv. |
| zingiberis | fʒi—iv. |
| Tannigen | gr. v—xx. |
| Terebene | ♏v—xx. |
| Terebinthina, Chian | gr. v—xx. |
| Terpin hydrate | gr. ii—x. |
| Terpinol | ♏ii—v. |
| Tetronal | gr. v—ʒj. |
| Teucrium | gr. xx—xxx. |
| Thallin | gr. i—viij. |
| Theobromin-lithium | gr. ii—iv. |
| Thiol | gr. ⅛. |
| Thymacetin | gr. viiss. |
| Thymol | gr. ss—ij. |
| Tiglii oleum | ♏¼—ij. |
| Tinctura aconiti | ♏i—v. |
| agarici | ♏xx—fʒj. |
| aloës | fʒss—ij. |
| et myrrhæ | fʒss—ij. |
| arnicæ florum | ♏x—xxx. |
| radicis | ♏v—x. |
| asafœtidæ | fʒss—j. |
| asclepias | fʒss—j. |
| belladonnæ | ♏x—xx. |
| benzoini | fʒss. |
| composita | fʒss—ij. |
| berberidis | ♏xx—fʒj. |
| boldi | ♏v. |
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